University of New Hampshire Durham, New Hampshire

Landscape Master Plan

Final Draft Document

Ayer Saint Gross, Architects • Saucier + Flynn, Landscape Architects

UNIVERSITY OF NEW HAMPSHIRE
LANDSCAPE MASTER PLAN

TABLE OF CONTENTS

Landscape Master Plan
Expanded Outline

LANDSCAPE MASTER PLAN

SECTION 1. INTRODUCTION

1.1. Correlation to the Campus Master Plan

The 2003 Campus Master Plan establishes a dynamic framework for the future development of the University's campus. The Master Plan depicts the overall organization and build-out of campus facilities, the reorganization of campus circulation and parking, and the preservation, restoration and enhancement of vital open spaces and natural systems. All of these changes will have a dramatic impact on the campus landscape. While it is important that change occurs it is equally important that the established character and identity of the Durham campus be preserved and enhanced wherever possible. The Landscape Master Plan complements the Campus Master Plan and will help facilitate the University's goal of developing a vibrant, attractive, and sustainable community set in a campus setting that expresses its regional sense of place.

1.2. Purpose of the Landscape Master Plan

The Landscape Master Plan provides a frame of reference for the design and management of the campus landscape. Preserving the traditional character of the grounds while at the same time ensuring it is developed and maintained in an ecologically sound manner is a complex undertaking. The Landscape Master Plan will aid in this effort by establishing design guidelines and landscape standards that foster sustainable design and management practices.

The Landscape Master Plan is organized into seven sections:

Section 1 – Establishes the principles that inform the development of the Landscape Master Plan.

Section 2 – Summarizes the evolution of the grounds and describes various natural and cultural features that contribute to the campus's unique sense of place and regional identity.

Section 3 – Provides an overview and description of campus open spaces. This section describes the spatial hierarchy of campus open spaces and clarifies the relationships between the various paths and places that comprise the campus open space system.

Section 4 – Consists of the Landscape Design Guidelines. Adhering to the guidelines will help preserve campus character while at the same time allowing for contemporary expression.

Section 5 – Consists of the Planting Guidelines. Adhering to the planting guidelines will ensure the development of an attractive and sustainable landscape.

Section 6 – Consists of the Landscape Standards, details and site furnishings selected for use on the UNH campus. Compliance with the standards will result in an attractive and harmonious landscape.

Section 7 – Details a series of recommendations aimed at renewing or enhancing the campus landscape. Some recommendations are general in nature and define goals that can be accomplished in incremental steps while other recommendations address situations that are project specific and require a concentrated effort.

1.3. Guiding Principles

To ensure continuity, the Landscape Master Plan is founded upon the same planning principles that guided the development of the overall Campus Master Plan.

- **Express the Academic Vision of the University**

  Landscape design and open space planning shall strive to improve the appearance and general condition of the University grounds to facilitate the recruitment and retention of an exceptional and diverse faculty, staff and student body.

  Campus planning and design shall recognize the landscape as an important educational resource and teaching tool fundamental to the successful fulfillment of the University's Land Grant Mission.

  Open space planning shall respect the tenets of Sustainability and recognize the crucial role the campus grounds serve in sustaining a healthy and biodiverse community.

- **Support the Daily Life of the University**

  Campus open space shall be designed to foster social interaction. Accommodations shall be made for a variety of uses ranging from large gathering spaces to small niches that facilitate casual encounters and quiet contemplation.

Outdoor recreation areas shall be designed to accommodate multiple uses. Outdoor areas shall be designed to accommodate active, scheduled recreation as well as spontaneous activities.

The campus landscape shall be enriched by the placement of appropriately scaled sculpture and public artwork.

- **Preserve the New England Character of the Built and Natural Campus**

Landscape design shall strive to reinforce the unique and authentic character of the regional landscape. Landscape and open space design shall incorporate the use of local building materials and native plant species whenever feasible.

Campus construction shall respect the integrity of healthy sites and make adequate provisions to protect existing trees and shrubs. Provision shall be made during the construction process to minimize adverse site impacts: limit compaction and avoid contamination of the soil and ground water.

Open space planning and design shall strive to strengthen the campus's unique sense of place by enhancing the Great Lawn and reinforcing the perceived image of a small New England liberal arts college.

Landscape design and open space planning shall strive to preserve campus woodlands and groves, reconnect fragmented habitats and restore degraded ecosystems. The potential for restoring degraded landscape such as the Ravine, College and Pettee Brooks will be strongly considered.

Open space planning and landscape design shall foster the development of a "walking campus" by reinforcing existing circulation patterns and strengthening pedestrian connections that are poorly defined.

Important pedestrian paths such as College Walk shall be designed to a pedestrian scale and enhanced with amenities such as benches, lamps, trash receptacles and pedestrian scaled paving patterns.

Landscape design shall strive to gracefully accommodate all members of the campus community. Enhancements to the campus landscape shall adhere to the tenets of universal design when possible.

Parking lots shall be perceived and designed as integral components of the campus open space system. The layout and design of parking lots shall respect the inherent organization of the campus and shall relate in scale and character to the surrounding landscape.

- **Strengthen the Relationship with our Communities**

  Landscape design shall enhance the quality and character of campus edges. Landscaping, signage, lighting and other site amenities shall be used to enrich the interface between campus and community.

  Landscape design and open space planning shall minimize adverse impacts on adjacent neighborhoods. Plant material, walls, and fencing shall be used to screen unpleasant views of parking lots, dumpsters or campus utilities.

  Campus gateways shall be clearly defined and enhanced with landscape treatments that are inviting and announce arrival. Gateways interior to the campus shall announce transitions from one area of the campus to another.

  Open space planning shall strive for the development of outdoor spaces, such as hiking trails, which serve all members of Durham community, residents and students alike.

SECTION 2. LANDSCAPE CHARACTER – SENSE OF PLACE

2.1. Section Introduction

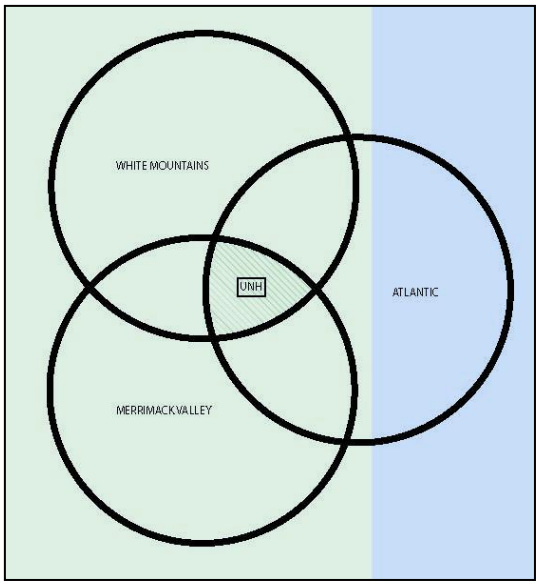
Few would dispute that the campus landscape is one of the University's greatest assets. The Great Lawn with its broad trees and rugged outcrops, the Ravine – deep, dark and cool – and the picturesque paddocks, pastures and corn fields, collectively define the University's character and sense of place. The campus landscape is an asset worth preserving and enhancing.

Before appropriate policies and guidelines can be established it is important to understand the natural and cultural context within which the grounds evolved. An understanding of that history is important to recognizing historic vestiges and natural features that contribute to the campus's sense of place. Natural forces have shaped much of the landscape's character. The temperate climate, the underlying geology, soil, and topography impact drainage and development patterns. This in turn has had great influence on campus aesthetics, influencing everything from the siting of buildings and configuration of open space to the selection of plant material.

The evolution of the cultural landscape has also influenced the shaping of campus character. Landscapes are dynamic. As a result, it is often the vestiges left behind by previous occupants combined with natural features that constitute a site's *genius loci*. In some cases these vestiges are obvious such as a historically significant building or a monument. But in many cases vestiges are subtle traces that have endured the passage of time and thereby establish tangible links to previous eras. Features such as a stonewall or a solitary gate post express the continuity of time and create accidental backgrounds that inform and enrich contemporary designs.

The management of the campus landscape also influences its character and sense of place. In climates such as New Hampshire, management practices related to snow removal have a profound affect upon the aesthetic character of the campus influencing the placement of plant material and site furnishings. De-icing adversely affects water quality, plant health, and soil chemistry. In the summer, cultural practices such as fertilization and pest control can threaten water quality and biodiversity. Yet failure to adequately maintain plant material diminishes their vitally and ability to withstand drought and pest infestation. The result may be plant decline, which adversely affects campus aesthetics and compromises the character and quality of campus open space.

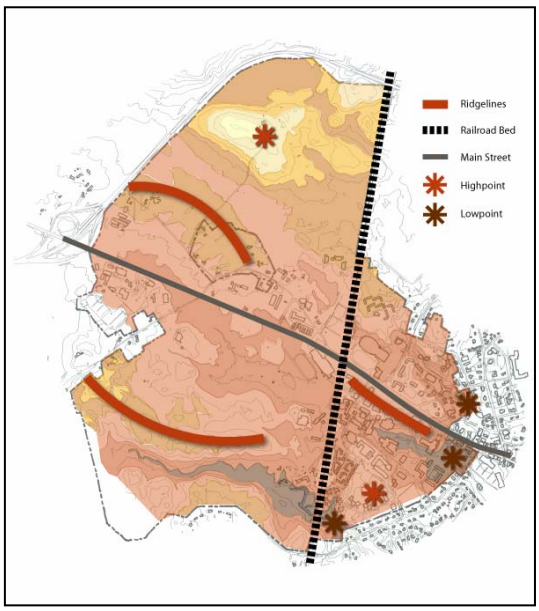
2.2. Regional Influences



The University lies at the convergence of three distinct regions: the Belnap/Moose Mountain range, the valleys of the Piedmont, and the Atlantic coast. Images of these greater landscapes are reflected in the campus landscape. The towering white pines of the College Woods Natural Area and the rugged outcrops adjacent the New England Center recall the mountains; the pastures, corn fields, barns and orchards reflect images common to the river valleys; and the marshes and wetlands remind visitors of coastal inlets and waterways. These are the landscapes that visitors pass through on their way to the campus. These are the images that students, faculty and staff bring with them to the University. When assimilated, these images collectively define the unique character of the campus landscape.

2.3. Natural Character

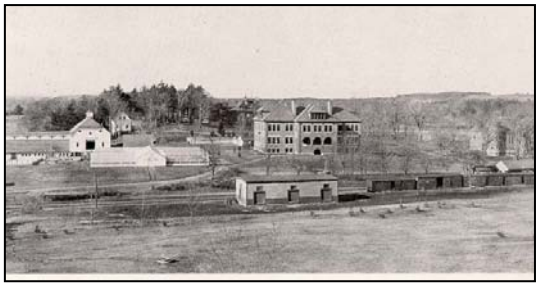
Natural features contribute to campus character. Vegetation, geology, soils, topography and hydrology, all influence the identity of the campus landscape. Durham is located on the edge of two major vegetation formations; the Northern Forest and the Central Forest. As a result of this, the indigenous plant palette is rich in diversity and includes firs, pines, hemlocks, and birches of the Northern Forest and oaks, maples, ashes and other hardwoods common to the Central Forest. Indigenous shrubs, vines and groundcovers associated with these formations results in a rich plant palette that reduces the need to import exotics to enrich campus aesthetics.



There is over a hundred and fifty feet (150') of elevation change throughout the campus. The campus highland is in the northwest quadrant on the Woodman Research Farm; the low point is diagonally across campus in the southeast quadrant along the Oyster River. Ridges and valleys, hilltops and knolls create a rolling topography and channel water into three waterways; College Brook, Pettee Brook, and the Oyster River. Where the landforms flatten, the stream flow slows and marshes and wetlands have emerged. This variety has led to the formation of unique habitats and microclimates capable of supporting a diverse population of flora and fauna. Biodiversity in an intrinsic characteristic of the campus landscape and should be fostered wherever possible.

2.4. Landscape Evolution

In June of 1891 the Board of Trustees commissioned Charles Eliot, a distinguished landscape architect and "regarded as a good man in his profession," to layout the grounds for a new college on the old Thompson Farm in Durham, New Hampshire. Aside from an orchard and a few scattered woodlots the land was rolling and relatively open. The bulk



of the farm was in pasture and hay fields. Early photos indicate that portions of the farm had been out of cultivation for some time and were in the early stages of succession. Red cedar, birch, brambles and other early succession plants were scattered amid the fields, especially in the area of the present day Ravine. There appears to be no record of the plan Eliot developed but through his correspondence with Professor Pettee and other members of the Board, we know he looked to the topography for clues in organizing the campus and sited Thompson Hall on the knoll occupied by Ben Thompson's former home. Eliot sited other buildings along this ridge and entered into negotiations with the railroad to realign their tracks to the west to enhance his plan.

Vestiges of this landscape are evident today and contribute significantly to the character of the University campus and its sense of place. Perhaps the most evident feature is College Woods Natural Area, formerly the old Thompson woodlot. But other contemporary features such as the agricultural fields, barns, and paddocks recall this period, as does Thompson Hall. Consequently, preserving and enhancing the agrarian character of the campus landscape, especially along Concord Road is fundamental to the preservation of the campus's unique sense of place.

By the 1920's the University had grown and the agrarian landscape was being transformed into the collegiate campus many hold dear today. In June of 1924, almost thirty-three (33) years to the day that the Board hired Charles Eliot, the University secured the services of another landscape architect, Brenner Pond, also of Boston. Pond was a graduate of Dartmouth College, and later in his career became the head of the Department of Landscape Architecture at Harvard. Pond worked closely with Eric Huddleston, a professor in the architecture department and the future designer of twenty-two (22) of the University's most distinguished buildings.[1] Together they created a plan that formalized the rural campus and introduced a new vocabulary of building and open spaces. Drawing upon 18th century Federal/Georgian style of architecture for inspiration, they organized the campus around a series of well-defined open spaces.

It was during this period that the campus infrastructure; roads, concrete walkways, dams, and buried utilities (sewer lines and drainage pipes) began to impact campus aesthetics. At the same time, new amenities such as terrace gardens, woodland trails, flowering shrubs and vase shaped street trees (elms) were introduced to the campus landscape. It was also during this period that the University introduced a new vocabulary of campus open spaces including the quadrangle, the athletic complex, and the amphitheater.

The landscape that evolved during the twenties and thirties typifies the landscape of the small New England liberal arts

college; large greenswards, well defined by red brick buildings and stately shade trees. This is the period that witnessed the transformation of the pastures along Main Street into the Great Lawn. It is important that the formal character of these spaces be preserved and that thoughtful renewal plans be developed to ensure that the spatial and aesthetic integrity of this classic landscape be retained.

In the decades following WWII the University experienced steady growth. By the early sixties the southern expansion of the campus had jumped the Ravine. No longer considered the back of the campus, the Ravine, by happy circumstance, became an important central open space and counterpart to the open Great Lawn. The early succession landscape of the agrarian period had matured into a shady glen dominated by white pine and mature hardwoods. In addition to serving as an aesthetic amenity, the Ravine became an important corridor in the campus's pedestrian circulation system.

The stately shade trees planted throughout the Great Lawn created a serene setting that, unfortunately, belied subtle yet detrimental changes occurring throughout the rest of the campus landscape. Many of the trees and shrubs planted earlier in the century had reached maturation and were beginning to experience decline. The arrival of Dutch Elm disease decimated the majority of street trees planted along Main Street and the expansion of surface parking eroded campus open space. Years of economic strains and tightened operating budgets led to deferred maintenance.

Campus expansion also had a detrimental impact on the campus's natural systems, especially with regard to storm water management. In the 1960's and 70's lax regulatory policies allowed for and indeed encouraged the burial of stream segments and the deposition of runoff into campus waterways. The proliferation of surface parking and impervious roof surfaces intensified runoff and strained the campus's capacity to control the discharge of stormwater. As a result flooding has become a perennial problem in College Brook. Contiguous woodlands and open space systems were fractured and the proliferation of invasive plant species radically altered the vegetative character of the Ravine.

These setbacks have heightened our environmental awareness and new attitudes and design practices are emerging that encourage stewardship while allowing for development and the further expansion of the campus. The Landscape Design Guidelines will facilitate innovative design and sound management of the landscape ensuring that the campus's unique character and sense of place is not only preserved but enhanced with the passage of time.

2.5. Landscape Management

While it is not within the scope of the Landscape Master Plan to address landscape maintenance practices it is important to note that the care of the campus landscape can have a profound impact on the preservation of campus character and its unique sense of place. Maintenance practices not only affect campus aesthetics but also the vitality of natural systems. The Landscape Design Guidelines provide direction with regard to the organization and aesthetic treatment of the campus landscape. While thoughtful guidelines can significantly reduce maintenance demands and encourage the implementation of sound management practices, it is equally important that a plan be prepared that facilitates a transition from the routine maintenance of the grounds to its proactive management.

Implementation of environmentally sound management practices such as an Integrated Pest Management (IPM) program will reduce the reliance on inorganic pesticides but such a program requires vigilant monitoring by skilled staff. It also requires quick response times to thwart the rapid build-up of pests and damaging infestations that can seriously compromise a plant community's vitality. Weakened plants often succumb to drought or other adverse conditions, such as new construction.

The transition to an environmentally sound management plan cannot occur within a social vacuum. Such a transition is a complex and potentially expensive undertaking that necessitates a long-term commitment by all parties involved. It also requires a concurrent cultural change, especially with regard to aesthetic values. For instance, reducing intervals between mowing generally improves the vigor and quality of Bluegrass lawns. However, this implies that the grass may be maintained at higher levels, 3½ - 4", which may result in a shaggier appearance. This image runs somewhat counter to the preferred image of the American lawn as a smooth green carpet. The Landscape Design Guidelines aim to facilitate this transition by providing insight as to where change can occur in an orderly fashion, at a reasonable pace, and in a culturally informed manner.

SECTION 3. LANDSCAPE TYPOLOGIES

3.1. Section Introduction

Throughout the campus landscape there are a number of diverse paths and places. The scale, function and aesthetics of these components may differ but collectively they make up the University's open space system. The purpose of campus planning and landscape master planning in particular, is to knit these components into a cohesive whole. Creating a harmonious environment is important not only for aesthetic or ecological reasons; it is important because the ambiance of an orderly landscape enhances the quality of campus life and has an enduring effect on the collegiate experience. This in turn, enhances faculty, staff and student recruitment and retention as well as alumni loyalty.

Campus open spaces have been ordered according to Natural and Built Systems. The landscape spaces within each system serve a distinct role ecologically, socially, and functionally. The preservation and restoration of natural systems is vital to developing and maintaining an ecologically sound and sustainable landscape. The renewal and enhancement of built systems is crucial to preserving the established character and identity of the campus landscape. The following landscape typologies form the foundation of the University's open space system.

3.2. Landscape Typologies

3.3.1 Natural Systems

Campus Woodlands

The woodland forest constitutes a major portion of the campus open space system. Campus woodlands are characterized by contiguous stands of native trees, shrubs, and groundcovers. Woodlands serve an important environmental, social and recreational role on campus. Environmentally the campus woodlands provide essential habitat for native flora and fauna. The woodland plants absorb carbon dioxide and release oxygen, trap dust particles, filter air pollution, prevent soil erosion, and reduce runoff into campus streams and the Oyster River (thereby protecting and enhancing water quality in the community reservoir).

Woodlands also enrich the quality of campus life for students, faculty and staff. They are valuable educational resources and are highly valued as formal teaching laboratories and outdoor classrooms. It is important that they are protected from undue encroachment. To facilitate an increased use and

appreciation of the campus woodlands it is important that pedestrian connections between the academic core of the campus and the woodlands be clearly articulated.

Campus woodlands are also important recreational resources and offer ample opportunity for active and passive recreation. Trails within the woodlands should be well maintained and clearly marked. Interpretive markers and orientation maps should be periodically located along the trails. Interpretive signage should be used to describe the woodland's unique heritage and the important role they serve in preserving the character and identity of the campus.

Gateways to the campus woodlands should be clearly marked and delineated with appropriate landscape treatments. Pedestrian amenities such as directional signage, lighting, benches, and trash receptacles should be incorporated into gateway designs. To ensure that the rustic character of the woodlands is preserved, site furnishing should be restricted to major gateways. However, consideration should be given to the strategic placement of a few granite "pedestals" along the trails to offer hikers an opportunity for rest or quite contemplation.

Campus woodlands include the College Woods Natural Area, the only protected woodland on campus, residual forests in the southwest quadrant, the Northwest Woods and forestlands on the southern edge of the campus between the Oyster River and Mill Road.

Campus Groves

Isolated forest stands comprised of native trees, shrubs, and groundcovers constitute campus groves. For the most part the groves (especially in the area near Christensen/Williamson/Hubbard dorms and the Philbrook Dining Hall) are remnants of woodlands that evolved on the site after farming operations ceased in the 19th century. Campus groves are important ecosystems and are critical to the vitality of the campus open space system. Ecologically they serve the same functions as the larger woodlands but are also important in providing pockets of "natural" habitat in the central portions of the campus. Groves provide food, shelter and protected nesting sites essential to the survival of songbirds and other small animals. Future expansion near or adjacent to campus groves should be thoughtfully designed and carefully executed to ensure the spatial integrity and ecological vitality of these areas is protected.

Campus groves are also important aesthetically because they recall the larger regional landscape thereby reinforcing the campus's unique sense of place. Consideration should be given to the development of a management plan that guides the gradual expansion and linkage of isolated woodlands within the academic core of the campus with the woodlands west of the railroad tracks. This can be achieved with minimal impact to campus aesthetics by thoughtfully reducing maintenance operations (mowing, weeding, and tree removal) and the strategic placement of native species indigenous to southern New Hampshire in ever expanding increments around the existing groves. Invasive plant species should be eradicated where feasible. Furthermore, a low level of maintenance should occur within these areas. The removal of organic matter such as fallen leaves and fallen trees (unless obstructing circulation) or the cutting of snags (unless posing a safety hazard) in the interior of these areas should be avoided.

Campus groves include the woodlands around the McLaughlin/Lord/Jessie Doe dorms, the area around the New England Center, the area surrounding the Alumni Center, the Ravine and the wooded area around the Christensen/Williamson/Hubbard and the Philbrook Dining Hall. There are also smaller groves along Main Street adjacent to the athletic fields.

Wetlands and Waterways

Wetland is the collective term for marshes, bogs, and other areas where water covers the soil or is at or near its surface at various times throughout the year. Waterways are streams and rivers. Pettee Brook, College Brook, and the Oyster River are the principal waterways and flow west to east channeling the majority of water through campus and eventually into Great Bay. In addition to Pettee and College Brook there are a number of smaller streams on campus, some of which are seasonal but nonetheless serve an important role in watershed management. Together wetlands and waterways constitute the lifeblood of the campus ecosystem.

Over the years, channel modification, reservoir construction, and land use changes have had an adverse impact on the vitality of campus waterways and wetlands. Segments of Pettee and College Brook have been buried or channelized. The development of impervious surfaces such as streets, parking lots and rooftops has significantly increased the amount and rate of runoff at the campus's edge. In some cases this has led to periodic flooding and the degradation of the

watershed downstream. It is important that future development compensates for these actions and includes remedial treatments that revitalize these systems and restore their ecological integrity.

Wetlands play an integral role in sustaining a diverse campus ecosystem. They are indispensable habitats and harbor a multitude of soil microbes, plants and wildlife. In addition, wetlands help regulate water levels and reduce seasonal flooding, reduce soil erosion, enhance water quality and provide opportunities for recreation while at the same time contributing to the natural beauty of the campus and its sense of place. The majority of campus wetlands are found in the southwest and northwest portions of the campus, west of the railroad tracks. The construction of the railroad line impeded the flow of water through campus and the subsequent construction of dams on Pettee Brook and the Oyster River impounded water for community reservoirs. There are additional, albeit smaller, wetlands scattered throughout the campus.

While wetlands make up a relatively small percentage of the Durham campus their presence can have a profound impact on campus development. While some wetland areas have been delineated, it will be important that all the wetlands on campus be delineated so that the University has a clear understanding of the extent of campus wetlands and their implication on the long-term build out of the campus.

Meadows, Paddocks and Open Fields

Meadows and farm fields constitute a significant portion of the campus open space system. Located primarily west of the railroad tracks along Concord Road, these types of open spaces are important to fulfilling the University's Land Grant mission. For the most part they are working landscapes and their management is influenced by cultural practices related to raising crops and livestock. Contemporary management practices such as Integrated Pest Management and the careful monitoring of soil conditions has mitigated the adverse impact that traditional agricultural practices once had on the campus environment. In fact, the meadows and open fields serve an important environmental role by providing habitat for birds and other small mammals. They are also effective in reducing overland flow rates and absorbing toxic substances from site runoff, which diminishes the build-up of noxious substances downstream where high concentrations can have an adverse effect on fisheries and other fragile ecosystems.

Aesthetically, the meadows, farm fields, and paddocks along Concord Road contribute to the University's image and unique sense of place. It is important that the rural character along this corridor be preserved and enhanced and the haphazard placement of structures and utilities should be avoided whenever possible. Wide visual sweeps that amplify the meadow image should be preserved and the open space integrity of meadows should be strengthened by the selective introduction of hedgerows, tree groupings and fence line treatments that enhance important edges and the organization of the agricultural complex. Four board equestrian fences should be used to delineate paddocks and pastures. These fences should be stained white and be kept in good repair and grass and noxious weeds should be kept in check so as to present a neat and orderly image of the campus. Large shade trees and hedgerows should be planted to enhance the quality of "farm lanes" connecting meadows and open fields with agricultural buildings.

3.3.2 Built Spaces

Gateways

Gateways are thresholds and are meant to convey a sense of arrival or signal transition from one campus area to another. Some vehicular gateways, such as the intersections of Mast Road and Concord Road or the intersection of Main Street and College Road require bold statements in order to clearly announce arrival and entry onto the campus. On the other hand, the intersections of Edgewood Avenue and Strafford Road or Main Street and Pettee Brook Lane are potential vehicular gateways but need not be elaborate in scale or design and may only require a subtle recognition that the visitor has arrived on campus.

Throughout the rest of the campus there are opportunities to create a series of pedestrian gateways to accentuate the transition from one area of the campus to the next. Entrance points into the Ravine, the Great Lawn, College Woods Natural Area and the Northwest Woods as well as various locations along College Way, Demeritt Way and Library Way are logical opportunities for gateways and offer excellent opportunities to enrich the pedestrian experience on campus. Gateways within the interior of the campus should be designed to a pedestrian scale. It is important they be spatially orientated and clearly articulated with paving changes, site furnishings, signage and vertical elements such as gateposts, trees or shrub massings.

Pedestrian gateways are also points of orientation. In the development of gateway designs accommodations should be made for directional signage and precinct maps noting building locations and other destination points. Lighting levels should be adequate to illuminate a sign's written message and associated artwork. Gateways are appropriate locations for bus stops and elements such as bus shelters and bicycle storage.

Campus Streetscapes

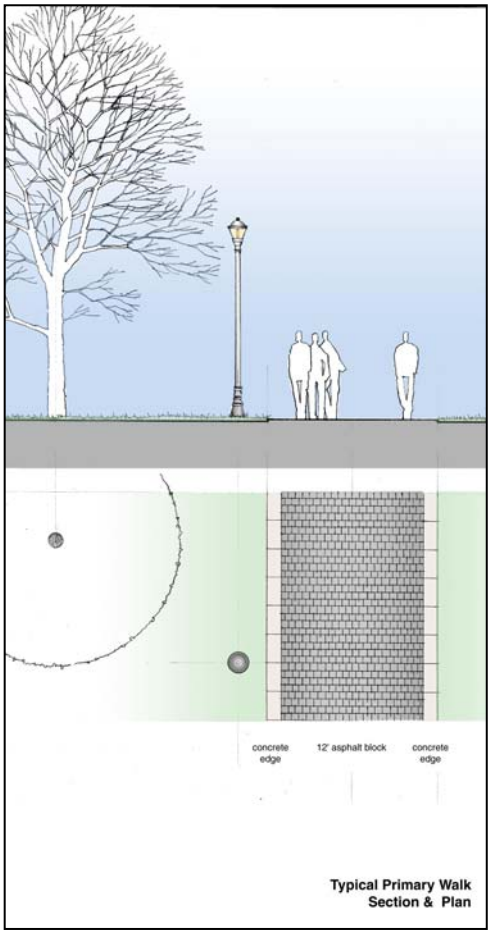
Approximately a dozen streets make up the campus streetscape system. Their principal function is to facilitate vehicular circulation through or around the campus. Streetscapes interior to the campus (College Road, McDaniel Drive, Forest Park, Williamson Drive, Demeritt Circle and Gables Way) help organize and connect disparate areas of the campus. These streetscapes should be unified through similar landscape enhancements in order to project an overall sense of harmony and balance reflective of the campus' unique character and identity.

Many of these streets also serve as important pedestrian corridors and vital components of the campus open space system. While campus streets should be designed to safely accommodate the vehicle they should be detailed to a humane scale to create a more pedestrian ambience. Their importance as pedestrian spaces should be emphasized through the thoughtful use of street trees, pedestrian lighting, and street furnishings such as benches and trash receptacles. Wherever feasible, esplanades should be developed between the sidewalk and curb to provide a strong separation between pedestrian and automobile. Pedestrian crosswalks should be clearly delineated and traffic calming devices such as speed tables or textured pavements within pedestrian crossings should be used to reinforce a pedestrian-oriented condition within the academic core of the campus.

In addition to enriching the pedestrian experience, streetscape improvements improve the overall image of the University and help project a positive first impression of the campus. For visitors arriving from the east, their perception of the UNH campus begins as they turn onto Main Street; for those arriving from the west their first perception of the campus begins along Concord Road; visitors arriving from the north first encounter the campus at the intersection of Edgewood Avenue and Strafford Road. Vehicular gateways should be developed in these areas to help convey a sense of arrival and entry onto campus. Garrison Avenue, Pettee Brook Lane and Mast Road Extension are important

neighborhood streets shared by the University and community. These streets should be viewed not only as vehicular corridors but also as shared open space that forms a common edge between the University and the Town of Durham. Streetscape improvements in these areas should be done in cooperation with local authorities and neighborhoods.

Campus Walkways



Typical Primary Walk
Section & Plan

Campus walkways are important design elements. Walkways, along with campus streets, provide structure and organization to the campus landscape. Walkways link buildings and open space and unify disparate areas into a cohesive whole. The hierarchy of campus walks should be conveyed through their organization, alignment, width, and the use of materials. Primary walks (College Walk, Library Way, and Demeritt Way) should be direct and wide enough to comfortably accommodate anticipated levels of use. Secondary (the majority of campus walks) and tertiary walks should be developed in a manner that links destination points with primary walks. New walkways should serve as unifying elements and should be in harmony with the surrounding area and respect the hierarchy established for campus walkways.

A visitor's first impression of the campus is influenced by the condition of campus walkways. Well-designed and maintained walkways enhance the pedestrian experience and project a positive image of the campus landscape. Haphazard "patch jobs" and the inconsistent use of paving materials throughout the campus compromises aesthetics and diminish the public's perception of the landscape.

Walkways are also social spaces. They are the places for casual conversations and chance encounters; they are places where students, faculty, and staff meet. Small nodes or courtyards at the intersections of walkways facilitate human interaction. Tertiary walks and trails facilitate contemplative strolls. The addition of amenities such as benches, trash receptacles, kiosks, and shade trees at these locations further enhance the users' experience.

Bicycle Facilities

Bicycles are becoming a more frequently used mode of campus transportation. The most effective way to encourage the greater use of bicycles on campus is to enhance the cyclists' experience. In the west lot, provision should be made for the secure, overnight storage of bicycles. Similar accommodations should be

considered in A-Lot.

As the campus expands to the west and more emphasis is placed on peripheral parking, shared use paths should be considered as the preferred pedestrian/cyclist connectors from the main campus to peripheral parking lots, outlying parcels and future housing developments. However, while it may be desirable to develop shared use systems in the future, current cycling should not be encouraged or allowed on campus walkways. Separate bike routes should be clearly delineated and marked with appropriate signage.

In addition to accommodating cross campus circulation, the safe storage of bicycles should be a primary consideration when developing campus site designs. Bike racks should be employed in sufficient numbers to minimize students locking bicycles to handrails, lampposts, signposts, and trees. Racks should be strategically located along primary walkways and within reasonable proximity to building entrances. They should be sensitively sited in well-lit areas with high visibility and well integrated with the architecture and surrounding landscape. Bike racks should not obstruct the regular flow of pedestrian traffic and snow removal and other maintenance issues should be taken into consideration when siting the racks. Consideration should also be given to incorporating bike storage into the design of transit stops and bus shelters.

Parking Lots

Over the years surface parking has reduced the amount of open space within the central core of the campus. The Campus Master Plan calls for the eventual displacement of many of these lots. However, that will not happen immediately and in the meantime parking solutions should strive to maintain a balance between parking demands and open space considerations.

Efforts must be taken to mitigate the adverse impact surface parking has on the landscape by reducing surface parking where feasible and thoughtfully designing parking lots that respect the character of primary campus open spaces. The configuration of parking lots should reflect the inherent organization of the campus and should relate to the scale and character of the surrounding landscape. Treed parking islands a minimum of 12’ in width should be incorporated into parking lot designs. Studies have proven that treed islands not only enhance the aesthetics of parking areas but they mitigate the adverse impact of heat build up associated with large expanses of paved areas.

While screening is important, it is more important that design solutions reinforce visual and physical connections between adjacent open spaces and preserve the sense of free flowing open space. Pedestrian connections between parking lots and primary destination points should be designed as integral components of the campus pedestrian system and should be spatially well defined and nicely landscaped.

Equally important are programming considerations for parking lots, especially surface lots interior to the campus where parking demand is high in the daytime but lower in evening. Parking lots can be designed to accommodate social and active recreational uses as well as parking uses. Fences, seat walls and landscape plantings should be incorporated into landscape plans adjacent to parking areas to provide spatial definition, screening, and to enhance the pedestrian character and scale of the facility. Amenities such as bluelight phones, benches and seating areas, bus stops, trash receptacles, adequate lighting, plantings, bike racks and bicycle storage lockers should be incorporated into design solutions to lend a humane scale to parking areas and enhance their aesthetic appeal.

Campus Quadrangles

Quadrangles are spatially well defined areas enclosed on three or more sides by academic or residential buildings. They represent one of the basic building blocks for defining campus open space, especially in the dense academic core. Quite often referred to as open quads (bordered on threes sides) or closed quads (bordered on all four sides) they are usually formal in character, i.e. restrained planting and simple geometric forms and walkway alignments.

The landscape treatment within a typical quad such as the area at Hitchcock/Randell/Devine, consists of level lawn, shade trees, and occasionally shrub massings at the corners or adjacent to the main entrances to buildings. Sidewalks tend to be axially aligned with building entrances, often crisscrossing the lawn or forming a perimeter around its edges. In addition to formal quads, there are a number of modified open quads on campus such as the area surrounding Christensen and Williamson Halls. These spaces are usually informal in character and may be defined on only two sides. In such cases the larger landscape flows into these spaces in a manner that blurs the edge of the space making it difficult to discern where the quad ends and the larger landscape begins.

The well-defined character of a quadrangle strengthens

its perception as an outdoor room. Consequently, quadrangles are expected to accommodate a multitude of active and passive uses. Quadrangles often host social functions such as weekly BBQs and annual alumni receptions. This places extraordinary demands on the turf. It is therefore important that turf areas within quadrangles be designed to accommodate high levels of use. Lawn areas within quadrangles should be adequately drained and depending on site conditions may require the installation of a subsurface drainage system. Fertile topsoil, a minimum of 8" deep, screened of rocks and debris should be considered a minimum standard. In certain cases, supplemental irrigation may be required to keep turf healthy and viable.

Formal building arrangements engender formal landscape treatments; loose and open arrangements, typified by the modified quad, call for more causal, contemporary landscape treatments. In all cases, landscape treatments within quadrangles should complement the architectural character of the buildings that define the space. Landscape treatments within quadrangles should be conducive to active recreation while allowing for smaller niches along the edges that can accommodate more passive and solitary experiences. Quadrangles should be well furnished with comfortable benches, pedestrian scaled lamps, trash receptacles, and bikeracks. When spatially feasible and aesthetically appropriate, recreation facilities such as volleyball courts and horseshoe pits should be incorporated into quadrangle designs.

The open space within quadrangles is intensively used and requires a high degree of landscape maintenance. Therefore, tree and shrub plantings within quadrangles should be durable consisting mostly of strategically placed trees and open lawn. Avoid trees that are shallow rooted and cast dense shade (sugar maples, beech); consider trees that have compound leaves such as honeylocusts, which cast dappled shade, allowing lawns to receive sufficient levels of light. Careful consideration should also be given to the placement of shrub masses and evergreen trees. Avoid creating places of concealment, especially adjacent to walkways, first floor windows and building entrances. Prune trees, hedges, and shrub masses annually and immediately remove graffiti and repair damaged site furnishings to maintain site character and "pride of ownership."

Campus Courtyards

Courtyards are important campus open spaces. They serve as social hubs and "urban stages" upon which the

drama of university life is played out. They are areas where social gathering and interaction occur. They should be spatially well-defined and flexible in design to accommodate a variety of events ranging in scale from political rallies and protests to solitary retreats.

Courtyards should be designed and detailed to a pedestrian scale and are most successful when the automobile is excluded. The strategic placement of courtyards is crucial to their success and they tend to be most successful when they are located at the intersection of major pedestrian corridors with multiple entry points. Views into and out of courtyards are also important. Visual connections should allow for unobstructed views of adjacent spaces and pathways. Courtyards should be predominately-paved, preferably with attractive unit pavers or combinations of pavers and bands of concrete. These materials are of a pedestrian scale and create a more welcoming and humane affect, even in extensively paved areas. Landscape treatment (shrubs, flowers and lawn) within courtyards should occur primarily on the periphery although large shade trees should be strategically placed within the courtyard to provide shade and spatial definition. South-southwest exposures are ideal for courtyards and if thoughtfully designed they can create “sun pockets” that can extend the outdoor season earlier in the spring and later into the autumn.

Ample seating is essential to the successful development of a courtyard. William Whyte noted in his book, “The Social Life of Small Urban Spaces” that while seating should be physically comfortable, it is more important that it be socially comfortable. Provide choice in the arrangement of benches and chairs. Seating should also be built into the design, capitalizing on the inherent “sittability” of features such as ledges, steps, and low walls. Combine sitting areas with trees; establish groves to create a sense of enclosure. Allow for one linear foot of seating area for every thirty square feet of courtyard space. Courtyards should also be amply lit to avoid dark corners or poorly lit niches and nodes. All courtyards and seating areas should be designed to universal accessibility design standards.

Courtyards are ideal locations for food vendors. Food animates campus spaces and attracts faculty, students and staff facilitating casual encounters and enhanced opportunities for learning. While there is a recognized need for them, there are relatively few courtyards on the University campus. Campus courtyards that do exist include Murkland Courtyard, Conant Courtyard, Whittemore Plaza, and several smaller quasi-courtyards such as the entrance court in front of Morse Hall and

the drop off area at the MUB. As the campus expands, consideration should be given to the development of more appropriately scaled and adequately landscaped outdoor spaces and courtyards.

Campus Lawns

Lawns are an important component of the University open space system. They serve a multitude of roles, aesthetically, culturally, and environmentally. Flowing freely around buildings and through open spaces, lawns create a sense of balance and harmony among diverse campus spaces. The Great Lawn, with its broad expanse of turf, defined by prestigious buildings and large shade trees, projects a powerful and memorable image. It typifies the traditional character of a collegiate landscape. Preserving this image is fundamental to preserving the character and identity of the UNH campus.

Lawns play an important role in supporting a high quality of campus life. A lush, green carpet of grass is one of the most sought after and admired elements in a campus landscape. Open lawns afford students, faculty and staff a range of social and recreational opportunities. Grass offers excellent wear tolerance enabling it to be used for active as well as passive recreation. The lawn in front of Scott Hall for example, with its southern exposure is a popular gathering area for students in the late spring and early fall. Sun bathing, studying, Frisbee throwing and picnicking are featured activities.

Cultivating large expanses of turf is labor intensive, consumes significant amounts of energy, and the potential runoff from fertilizers and pesticides may contaminate surface and ground water. On the other hand, responsibly maintained lawns contribute to the campus's environment. Lawns, like trees and other plants, help minimize soil erosion, trap dust particles, bind and store carbon dioxide, furnish oxygen, filter and purifies water, and moderates surface temperature and humidity. These latter attributes and contributions merit the discerning use of lawn on campus.

Careful consideration should be given to the layout and configuration of lawn areas to ensure that they can be efficiently mowed and maintained. Consideration should also be given to circulation patterns around and across proposed lawn areas. Designers should strive to accurately predict pedestrian flow and provide functional walkways in the initial design. To discourage the development of "cow paths," the installation of post and chain details, low plant beds

and the strategic placement of site furnishings such as benches, trash receptacles and bike racks should be considered in locations prone to shortcutting.

Whenever possible, storm water management plans should call for the slow movement of water across lawn areas to encourage the retention of storm water and the collection of pollutants. Avoid the indiscriminate use of lawn drains and other devices that quickly channel water into the storm water system. When designing lawns, create relatively flat areas (2% - 5% pitch) that comfortably allow for activities such as sunbathing and picnicking. Lawn areas with slopes greater than 4:1 (25% grade) should be avoided.

Microclimate is important to the successful establishment and long-term management of campus lawns. Careful thought should be given to the proper selection of turf grasses as well as the placement of large evergreens and deciduous trees that have shallow roots and cast dense shade on lawn areas. Wherever possible, strive to reduce lawn maintenance by specifying seed mixes appropriate to the situation. Avoid creating small, isolated patches of lawn and avoid placing lawn in areas that do not receive a minimum of six hours of sunlight per day. In areas such as these alternative surface treatments such as groundcovers should be considered.

Campus Gardens

The term garden conjures up a host of diverse images ranging from spatially well-defined areas intended to serve as outdoor rooms to thematic collections of individual plants thoughtfully arranged in the landscape. The new garden on the west side of Murdough Hall is an example of the former; the landscape planting in front of Hood House is an example of the latter. In either case, they are dynamic spaces and even the most carefully planned "maintenance free" garden demands periodic attention. Therefore, campus gardens should be developed with restraint and only in conjunction with a long-term maintenance plan that ensures their vitality.

At the same time, gardens enrich the quality of campus life and offer opportunity to create a diversity of outdoor spaces that can accommodate a range of experiences designed to nurture the spirit as well as the eye. Some gardens should be designed as public spaces intended to foster gatherings and social interaction while other gardens should be designed to provide solitude and opportunity for quiet contemplation and renewal. An area within the Ravine can address the

former while a series of small niches thoughtfully located within the academic core can address the latter.

While they may serve many missions and assume many styles of expression, it is important that gardens be perceived as more than a mere collection of plants artistically arranged. Gardens are *built spaces* that reinforce the overall organization and structure of the campus landscape. They should relate to the greater landscape in scale, proportion and use and be conceived as extensions of a balanced open space system. They should also relate aesthetically, contextually and spatially to the adjacent buildings and landscapes they are intended to serve.

Gardens should reinforce the intellectual mission of the University and serve as outdoor classrooms and teaching laboratories. The amphitheater on the east side of Rudman is such an example. Opportunities exist to create similar spaces adjacent to the Paul Creative Arts Center and within the enclosed area adjacent to Parson/Iddles. Future opportunities will present themselves when the landscape between Rudman and Hewitt is reclaimed. When designed to support the academic mission of adjacent buildings it is important that gardens relate in scale and architectural character.

Gardens also offer opportunity to reinforce the region's unique sense of place by creating pockets of natural habitat that enhance biodiversity on campus. When developing such spaces, thought should be given to how the garden can reinforce the natural organization of the campus and help restore the fragmented landscape. In such cases, preference should be given to the use of native plants and a maintenance regimen that fosters natural succession, which is conducive to the development of a sustainable landscape.

These types of gardens also offer the most opportunity to create living laboratories. The Ravine is a campus open space used for teaching and research. Improvements to the Ravine, such as defining its boundaries with a stonewall and creating portals that delineate entrances will strengthen the perception of this area as an important campus open space. Opportunity exists to further enhance and extend this natural area by reclaiming the landscape currently occupied by "C" lot and extending the natural character of the Ravine northward into the area of the Dell.

Building Plates

The building plate encompasses that portion of the campus landscape that is disrupted due to the

construction of new buildings or the restoration of existing facilities. This includes the project staging area and all other portions of the landscape disturbed or altered during the construction process. It is important that as new buildings and facilities are added to the campus that the proposed site design and landscape plan for such facilities relate to the established hierarchy of the campus open space system.

Avoid the use of extensive foundation plantings that form a continuous band around the base of the building. Such treatments are costly to maintain and often detract from the architecture and obscure subtle design details. Tree and shrub placements should correlate to the architectural massing of the building and frame and enhance building entrances. Entryways should be safe, and well lit. Avoid creating places of concealment, such as large shrub masses near first floor windows or building entrances. Deciduous trees should be sited along the south-west sides of buildings to provide cooling shade. Evergreen trees should be strategically located to screen buildings and outdoor areas from the prevailing northwest winter winds.

The development of outdoor spaces such as courtyards, terraces, and small garden niches should correlate with adjacent interior social spaces so as to enhance views of outdoor rooms from within the building and facilitate direct access to the garden from building entrances.

Seating and other site amenities such as benches and trash receptacles should be provided near entrances to facilitate spontaneous gathering and social interaction. Bikeracks should be strategically located along primary paths in reasonable proximity to building entrances but should not compromise the entry experience. Strategically place lighting fixtures to illuminate entry points and provide a uniform wash of light throughout the site.

Landscape designs should allow for reasonable service access to buildings to facilitate the maintenance of building systems or the delivery of goods and services. Dumpsters and utility locations should be thoughtfully resolved and carefully incorporated into the overall site design. Dumpsters and utilities should not be located near primary building entrances or along primary walkways.

SECTION 4. LANDSCAPE DESIGN GUIDELINES

4.1 Section Introduction

The Landscape Design Guidelines establish a framework to guide the subtle enhancement of the campus landscape not transform it. The guidelines build upon, not radically alter, the campus' rich design heritage by emphasizing simplicity, balance and ecological sensitivity. The Landscape Design Guidelines are principle based, founded on the tenets of sustainability and the belief that landscapes should be managed not simply maintained. They are flexible and allow for contemporary expression. Long-term management considerations must be weighted equally with issues of aesthetics and sustainability.

These guidelines are divided into 4 parts: Landscape Preservation, Landscape Restoration and Landscape Enhancement. The Landscape Design Guidelines also include the University's standards for Site Furnishings. See the *Landscape Master Plan* for more detailed description of the Landscape Design Guidelines.

4.2 LANDSCAPE PRESERVATION

Preserving the cultural heritage and ecological integrity of an expanding campus landscape is a collaborative process between the client, the designer, the builder and those responsible for its long-term upkeep. The following policies should be adopted to protect the campus landscape before, during and after construction.

Construction Envelopes

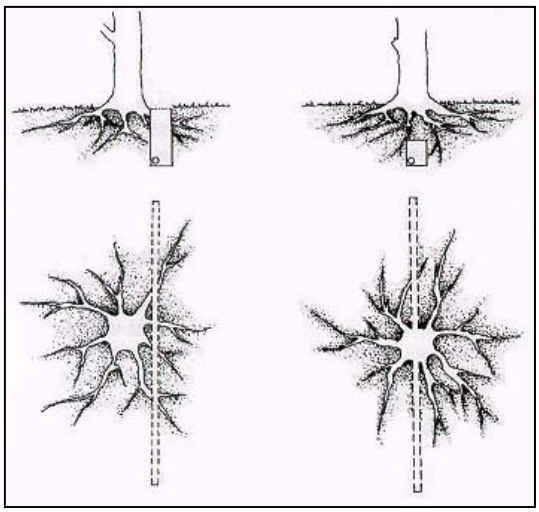
Prior to the initiation of design it is important that the project site be thoroughly inventoried to ascertain the location of valuable site features and fragile areas that will need protection during the construction process. By consensus it is important that the design team establish a *construction envelope* that includes the footprint of any new structure as well as a carefully delineated work zone.

Once a construction envelope is established, all areas outside the *construction envelope* shall be regarded as a protected area and shielded by construction fencing prior to the initiation of *any* site disturbance. The limits of the *building zone* should be recorded on all design and construction documents. Protected areas should be completely off limits to any construction activity including equipment parking, cleaning stations or materials storage.

Within the construction envelope a *staging area* should be clearly delineated. In those cases where the construction envelope is not of sufficient size to support all construction

activities, a staging and storage area off-site shall be designated. Contractors should be required to park all construction equipment and private transportation within the *construction staging area.* No parking should be allowed outside the designated *construction staging area*. If site conditions limit the parking area within the staging area, construction workers should be expected to car pool from remote parking lots. All chemical mixing and disposal should occur within the *construction staging area.* The cutting or drilling of inorganic materials such as metal, plastic, concrete, or treated wood should occur within the *construction staging area.* All stockpiling of materials should occur within the *construction staging area.* Whenever possible, institute "just-in-time delivery" practices.

Minimize Utility Impacts



Careful consideration should be given to the routing of underground utilities; minimize the disturbance to plant root zones and fragile areas of a site. The additional cost in materials and labor to route utilities around the root protection zone is quickly off-set by reduced costs associated with the long-term maintenance of damaged or weakened plants. Where it is not practical or feasible to avoid encroachment of the root protection zone, consider alternate steps to minimize damage to plant roots.

Topsoil Preservation

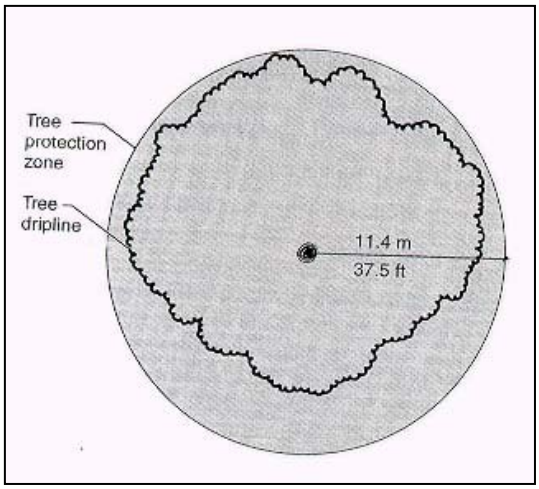
When not protected, soils are easily damaged. Soil restoration is an expensive and time-consuming process. Protecting the soil during construction is a fundamental sustainable practice. Carefully remove topsoil from all areas to be disturbed and store all topsoil on site or at a nearby location protected from sheet drainage that may contaminate degrade the soil's condition. Avoid situations that lead to soil compaction. Restore all compacted areas by tilling and adding soil amendments based on recommendations by the Landscape Architect, Grounds Superintendent, or consulting Soils Specialist.

Plants Suitable for Protection

Preserving the vitality of the campus' trees is paramount to preserving the character and integrity of the campus landscape. It is the goal of every construction project to protect as many trees as possible during construction so that the landscape looks as mature and cohesive as possible. It is therefore important that tree preservation be considered early in the planning and design process. Trees that are landmarks, significant in form or serve a vital aesthetic role shall be given special consideration in the evaluation process.

However, trees that are unhealthy, structurally unsound or are in the final stages of decline should not be considered as candidates for tree preservation. It is also important that trees selected for preservation not place undue burden on the construction process, significantly increase construction costs due to extreme protection measures or create unreasonable demands on future maintenance.

Root Protection Zone



Protecting the root system of a plant is fundamental to preserving it during the construction process. The *root protection zone* is the area around a tree or group of plants in which no grading or construction activity may occur. The size and configuration of the *root protection zone* depends on species sensitivity to construction, health and age of the plant, and root and crown conformation. The *root protection zone* should be designated by a certified arborists or horticulturalist.

If regrading must occur within the root protection zone, strive to limit cuts and fills to no more than 6". Strive to limit disturbance within the root protection zone and limit removal of the root system from any one side. Minimize site disturbance near plants to be disturbed and carefully monitor trees disturbed during construction. Continue to evaluate trees post construction for a period of two years to detect general decline that may result from construction impacts.

4.3 LANDSCAPE RESTORATION

Introduction

An examination of the campus's evolution reveals that the degradation of the landscape began long before the University was founded. Eighteenth and nineteenth century farm practices took a tremendous toll on the landscape. The extensive clearing of native forests resulted in an irreplaceable loss of indigenous flora and fauna. The subsequent construction of the railroad and the building of two dams further compromised the already altered natural systems.

In the short term, restoring damaged ecosystems is an expensive process. Not restoring them, may have dire long-term ramifications that will eventually necessitate an even greater expenditure of labor, energy, time and money. It is important that the University takes a proactive position in respect to the restoration of degraded landscapes, streams and wildlife habitats in particular. The restoration of stream banks and natural habitat is a complex process, the detail of which exceeds the scope of this master plan.

Reconnecting the Fragmented Landscape

Within the academic core of the campus there are a number of opportunities to restore or strengthen connections between disjointed landscape elements. Restoration of the Ravine is central to revitalizing the campus landscape. Invasive species such as Norway maple, barberry and honeysuckle have compromised the aesthetic character and beauty of the Ravine and should be eradicated. The edges of the Ravine are ill defined. It is important to strengthen the identity of the Ravine and celebrate passage through it. This can be accomplished via the construction of a stonewall around its entire perimeter. Celebrate procession through the Ravine by developing a series of gateways strategically located at primary and secondary entrances. Further enhance the Ravine by improving the trail system and creating seating and gathering areas.

Opportunities to expand the perceived limits of the Ravine should also be explored especially in the area of the Dell, the landscape surrounding the MUB and the open space around Horton Hall. In these areas, trees and shrubs should be planted and the amount of mowed lawns should be reduced to encourage the restoration of the native woodland. Similar opportunities should be explored in the area adjacent to "C"-Lot.

Enhance connections between fragmented stands of woodlands and campus groves such as the woodlands south of McDaniel Drive. Steps should be taken to rejoin these woodlands with the woodlands in the central portion of the campus. Careful consideration should also be given to restoring the riparian buffer along the entire length of College and Pettee Brooks.

Stream Restoration

To prevent the further degradation of wetlands, a comprehensive Watershed Protection Plan should be further developed beyond those that have been delineated in numerous portions of the campus. It is important that the *entire* watershed be considered when developing the plan's goals and objectives. Manage campus wetlands to control non-point source pollution and control runoff to lessen downstream flooding. Respect shoreline protection setbacks: do not site structures within 50' of a shoreline reference line. Do not apply any fertilizer within 25' of a shoreline reference line. Where existing, a natural woodland buffer should be maintained within 150' of a shoreline reference line unless activity is related to that shoreline. Identify locations of point source pollution and develop appropriate mitigation plans. Wherever feasible, develop landscape plans that daylight buried streams and restore/enhance natural corridors linking fragmented ecosystems.

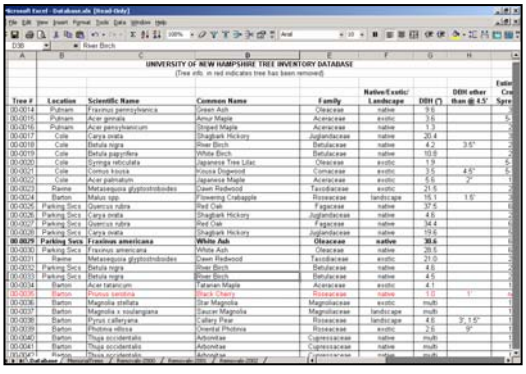
Habitat Restoration

Planting efforts beneficial to wildlife are encouraged. Plant shrub masses to provide critical habitat for small animals and songbirds, especially within the academic core of the campus. In some cases, the preservation of dead or dying trees that provide dens and nesting places for wildlife should be considered, however, aesthetics and public safety should be prime considerations. Do not save trees that pose a potential hazard or detract from the general aesthetics of the campus. Develop an interpretive signage program to foster a greater awareness relevant to the importance of preserving and restoring native habitats. Identify and protect sensitive or fragile ecosystems from future construction and route campus trails to avoid these areas.

Tree and Plant Management

A review of the Campus Tree Inventory reveals that 15% of the campus' trees are in poor condition and another 35% are categorized as only being in fair condition. 3% of the trees in the inventory were listed as dead. This indicates that only 47% of the University's trees are in good condition. Update the Campus Tree Inventory on an annual basis. Monitor and remove all dead trees within the academic core and residential areas of the campus. Trees that do not pose a safety hazard and serve as wildlife habitat can be slated for removal at a future date or left if they do not detract from campus aesthetics.

Consult with a Certified Arborist to identify trees listed as in Poor condition that will need replacement within the next two years. Prioritize trees that pose a threat to public safety or harbor noxious pathogens. These trees should be slated for immediate removal. Identify trees listed in Poor or Fair condition that with remedial treatment to the tree itself or the surrounding site, can be rejuvenated.



UNIVERSITY OF NEW HAMPSHIRE TREE INVENTORY DATABASE

(Tree info. in red indicates tree has been removed)

Tree #	Location	Scientific Name	Common Name	Family	Native/Exotic/ Landscape	DBH (")	DBH other than @ 4.5'	Entire Crown Spread
00-0014	Putnam	Fraxnus pennsylvanica	Green Ash	Oleaceae	native	9.6		
00-0015	Putnam	Acer ginnala	Amur Maple	Aceraceae	exotic	3.6		5'
00-0016	Putnam	Acer pensylvanicum	Striped Maple	Aceraceae	native	1.3		
00-0017	Cole	Carya ovata	Shagbark Hickory	Juglandaceae	native	20.4		
00-0018	Cole	Betula nigra	River Birch	Betulaceae	native	4.2	3.6"	
00-0019	Cole	Betula papyrifera	White Birch	Betulaceae	native	10.6		
00-0020	Cole	Syringa reticulata	Japanese Tree Lilac	Oleaceae	exotic	1.9		5'
00-0021	Cole	Cornus kousa	Kousa Dogwood	Cornaceae	exotic	2.5	4.5"	5'
00-0022	Cole	Acer palmatum	Japanese Maple	Aceraceae	exotic	5.5	7'	
00-0023	Rainie	Metasequoia glyptostroboides	Dawn Redwood	Taxodiaceae	exotic	21.5		
00-0024	Barton	Malus spp.	Flowering Crabapple	Rosaceae	landscape	16.1	11'	
00-0025	Parking Svcs	Quercus rubra	Red Oak	Fagaceae	native	37.5		
00-0026	Parking Svcs	Carya ovata	Shagbark Hickory	Juglandaceae	native	4.6		
00-0027	Parking Svcs	Quercus rubra	Red Oak	Fagaceae	native	34.4		
00-0028	Parking Svcs	Carya ovata	Shagbark Hickory	Juglandaceae	native	19.6		
00-0029	**Parking Svcs**	**Fraxinus americana**	**White Ash**	**Oleaceae**	**native**	**30.6**		
00-0030	Parking Svcs	Fraxinus americana	White Ash	Oleaceae	native	20.5		
00-0031	Rainie	Metasequoia glyptostroboides	Dawn Redwood	Taxodiaceae	exotic	21.0		
00-0032	Parking Svcs	Betula nigra	River Birch	Betulaceae	native	4.8		
00-0033	Parking Svcs	Betula nigra	River Birch	Betulaceae	native	4.5		
00-0034	Barton	Acer tataricum	Tatarian Maple	Aceraceae	exotic	4.1		
00-0035	Barton	Prunus serotina	Black Cherry	Rosaceae	native	3.5	3'	
00-0036	Barton	Magnolia stellata	Star Magnolia	Magnoliaceae	exotic	multi		
00-0037	Barton	Magnolia x soulangiana	Saucer Magnolia	Magnoliaceae	landscape	multi		
00-0038	Barton	Pyrus calleryana	Callery Pear	Rosaceae	landscape	4.8	3', 1.5"	
00-0039	Barton	Photinia villosa	Oriental Photinia	Rosaceae	exotic	2.6	9"	
00-0040	Barton	Thuja occidentalis	Arborvitae	Cupressaceae	native	multi		
00-0041	Barton	Thuja occidentalis	Arborvitae	Cupressaceae	native	multi		
00-0042	Rainie	Thuja occidentalis	Arborvitae	Cupressaceae	native	multi		

A Campus Tree and Shrub Master Plan should be developed to guide the scheduled replacement of affected trees and shrubs. The schedule should note anticipated removal dates and anticipated planting dates. The plan should also note the proposed location, botanical name, common name and size of replacement trees and shrubs.

In conjunction with the development of the Master-Planting Plan a detailed replacement budget should also be developed that projects removal costs, plant material costs and other costs associated with the installation of replacement plants. The budget should include projections for maintaining the plants (watering, pruning & fertilization) for a period of 18 months.

4.4 LANDSCAPE ENHANCEMENT

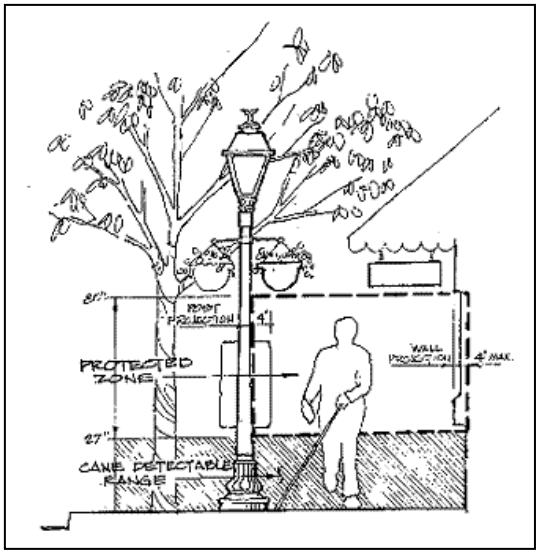
These enhancements are meant to inform the general planning and standard site design policies and procedures. Adherence to the guidelines will ensure the development of an attractive and cohesive campus.

Campus Accessibility

The following recommendations are based on design principles and guidelines developed by the Architectural and Transportation Barriers Compliance Board (a Federal agency) and the Public Right-of-Way Access Advisory Committee (PROWAAC) as a minimum standard for access across the campus. Over time greater degrees of access will be expected and it is useful to anticipate these upcoming standards to the greatest degree possible within the resources of the institution. In general accessibility should:

- Provide for equal opportunity and maximize accessibility for all users
- Be reasonable in cost
- Be clear, simple and understandable
- Be enforceable and measurable
- Be constructible and maintainable within today's technological capabilities
- Address safety for both pedestrians and motor vehicle operators
- Provide guidance for implementing agencies and the public
- Be flexible enough to include future technologies
- Be consistent with ADAAG
- Support independent use by persons with disabilities

Accessible Routes and Walks

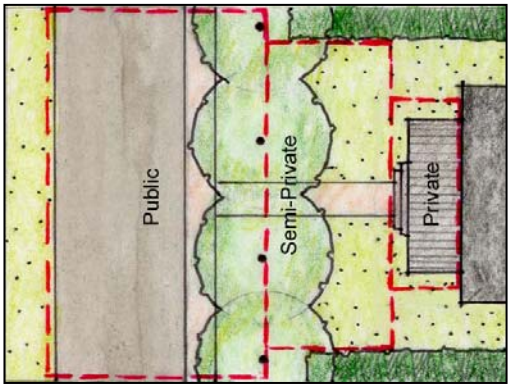


Provide a continuous unobstructed path connecting all accessible elements, places and spaces of the campus. Accessible Routes shall coincide with the route planned for the general public to the maximum extent feasible. Accessible routes provide more than the minimum of access features and dimensions. Design considerations shall also address how accessible routes are affected by rain, snow, or ice. Accessible Routes shall be looped, avoid dead ends.

Sidewalks, trails, and shared-use paths leading to outdoor developed areas shall conform to the guidelines presented in the Accessibility Guidelines For Outdoor Developed Areas. Campus sidewalks shall have a clear width of not less than 72". Nowhere may the cross section of an accessible sidewalk exceed 1:48 (2%). Placement of street fixtures, utility covers, gratings and other covers should be outside the

entire public sidewalk to the maximum extent feasible. If drainage gratings are located within an accessible sidewalks, the grate shall have no spaces greater than ½" wide in one direction.

Safety and Security



Maintaining a safe and secure campus is a proactive process that encompasses a range of issues, some of which are related to landscape design. With an understanding of basic design principals, a thoughtful designer can develop a landscape plan that is aesthetically pleasing, functional, and an important component of a campus wide crime prevention program. In recent years the concept of Crime Prevention Through Environmental Design (CPTED) has gained recognition as an important component of a crime prevention program. Proponents of CPTED assert that the potential for criminal activity to occur on campus can be reduced through thoughtful design and consistent maintenance. A CPTED plan is built on four principles:

Territoriality

A well-defined space promotes "ownership" and makes it easier to identify intruders. Site plans should be developed so that public, semi-private and private zones can be clearly discerned. Physical and symbolic barriers should be used to separate and differentiate various zones. To the extent possible, interior and adjacent exterior spaces should relate physically and programmatically. The character and spatial organization of semi-private and private zones should imply a sense of "ownership" by designated users.

Access Control

Limiting site access points guides circulation and minimizes "escape routes." Entrances, exits, and circulation through public, semi-private and private spaces should be thoughtfully resolved. Barriers, such as fences or low hedges should be used to obstruct potential "escape routes."

Surveillance

Open designs that allow for natural surveillance and are free of obstacles and places of concealment offer the most protection against crime. Coordinate the layout and installation of emergency "blue lights" with Campus Safety & Security to insure adequate coverage throughout the campus. Minimize the use of objects that may limit visibility into and/or through a site. Avoid creating places of concealment, such as

shrub masses, near first floor windows or building entrances. Strategically place lighting fixtures to illuminate entrance and exit points and provide a uniform wash of light throughout the site. Visual corridors should be maintained in open park-like settings as well as in densely planted areas. In a visual corridor limit the height of shrubs to 3' and insure that tree branches are maintained at least 6' from the surface of the ground.

Maintenance

Good maintenance is important to maintaining the quality of a space that engenders pride of ownership. It is important that trees and shrubs are annually pruned to keep them neat and orderly and to prevent overgrowth that may reduce visibility. It is also important to repair or remove damaged furnishings and keep the area free of graffiti.

Campus Seating

Campuses are social spaces. They are most successful and memorable when their design affords opportunity for a wide range of social interaction ranging from formal gatherings to chance encounters and quiet retreats. One element that facilitates the pleasure and enjoyment of such encounters is comfortable seating. Create intimate seating niches throughout the campus to encourage informal encounters between students, faculty and staff.

Seating walls are important design components within social spaces. Although somewhat expensive, their use should be encouraged to define the edges of spaces and to provide informal seating. Seat walls should have a minimum height of 17" and should not exceed 36" in height. (17-19" is considered an ideal height for a seating wall.) Seat walls intended to accommodate users from only one side should have a minimum width of 18". Seat walls intended for use from both sides should have a minimum width of 36". The top of seat walls should be slightly sloped to shed water.

Seating opportunities at important gateways, building entries and intersections of walkways should be provided to encourage social interaction. Seating areas should be protected from winter winds and uncomfortable drafts. Locate seating in suntraps that enable the use of the outdoor areas in the fall and spring.

Locate campus seating near areas where food is served. Make provision in seating areas for food carts and other vendors. Seating within plazas and other open spaces should afford a variety of exposures, orientations, and views. Seating opportunities should be developed within the Ravine and campus groves to offer opportunities for quiet reflection and

enjoyment of the natural surroundings.

Stairs and Steps

Campus stairs are important site design components. They not only facilitate pedestrian circulation they add character and if thoughtfully done, stairs can serve as seats, stages, and even focal points in a site design. However, stairs do pose maintenance concerns and limit accessibility for some users, especially in the winter when snow removal and ice control may significantly increase maintenance demands. Consequently, stairs should be developed with restraint and should not be the sole landscape design for grade changes. When proposing campus exterior stairs the following design criteria should be considered.

Exterior stairs should rest on concrete stringers. The selection of tread type, i.e. cut granite, split faced granite or concrete will depend on site specific conditions and the desired effect the stairs will have in the landscape. Campus steps should be a minimum of 6' wide and have a minimum of two risers, strive for three. Outdoor steps with a single step should be avoided. The height of the risers shall be held constant within any particular stairway or set of stairs for safety reasons and ease of ascent or decent. Treads should not vary in width except where the character of the design requires. Stair treads shall be roughly textured providing a non-slip character under both wet and dry conditions.

A good rule of thumb for tread to riser ratio is that 2(riser) + tread = 24-27". Common ratios are: 6" risers & 13" treads for stairs attached to buildings. 5" – 5 ½" risers with 15" treads for stairs in the landscape. A lower riser to tread ratio in the landscape reduces the grade adjacent to steps, (from 45% to 33%) which lessens the chance for erosion due to channeling of drainage along the sides of cheek walls.

In addition to lowering the grade it is a sound practice to maintain a stand of turf, groundcover or shrub planting adjacent to cheek walls. The practice of using exposed stones adjacent to cheek walls is unsightly and potentially hazardous. Rocks and debris often wash down the hillside and accumulate on the lower landing becoming tripping hazards or can become missiles if struck by a mower. This practice should be avoided whenever possible.

Handrails are important design components and should be installed on all stairways with more than 2 risers. Handrails should be black color-coated galvanized extruded steel, stainless steel or unpainted galvanized rails outside the depending on site-specific conditions and design criteria.

Announce exterior stairways with landscape treatments such as plantings, lighting, and benches. Plant material sited

adjacent to stairways shall not produce litter such as seeds, flowers, and/or fruit that can create slippery or adverse walking conditions.

Landings between stairways should employ the "Multiple of Five" rule, which provides for five steps per landing and an alteration between left and right foot when stepping onto and off a landing.

Timber steps shall be restricted to woodland trails, jogging paths, and for use as temporary steps associated with temporary campus walks.

Campus Walls

Site walls shall be thoughtfully resolved and integrated into the overall design. Careful consideration should be given to their alignment and the manner in which they terminate in the landscape. Wall materials such as landscape timbers and Versa-loc are aesthetically inappropriate for use within the academic core. A structural engineer should review drawings for retaining walls higher than 4'.

Freestanding walls throughout the campus should be constructed of native stone whenever feasible. Stonewalls enrich campus character and reinforce its sense of place. Stonewalls within the academic core should have a split face and be secured from a local source unless otherwise specified in project drawings and/or specifications. Stone walls designated for use in other areas of the campus can be constructed of local fieldstone unless their role calls for a more formal appearance.

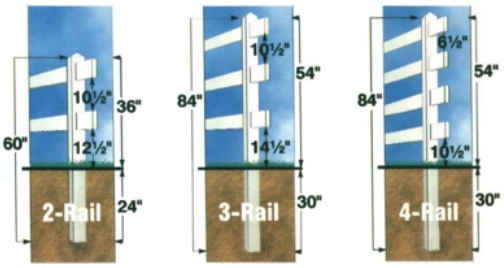
Concrete retaining walls, when called for should be thoughtfully resolved. Consideration shall be given to enriching the character of concrete walls with subtle scoring patterns and capstones. Capstones shall extend the full width of the top of the wall. Capstones shall be sloped 2% in the downhill direction. Weep holes shall be carefully integrated into the design of solid walls. Care must be taken to insure that seepage does not stain the walls surface or the pavement at the base of the wall. Surface drainage behind and above the wall should be intercepted with a diversion swale to prevent surface water from flowing over the top of the wall.

Architectural walls (walls integral to the building) should be used to extend the architecture into the landscape and unify the building and its site. Architectural walls should be compatible with the proposed building but respectful of site context. Architectural walls should be used to provide seating in plazas and near building entries. Architectural walls should be used to screen dumpsters and utilities whenever possible.

Campus Fences

Fences are important landscape design elements and should be used to delineate the edges of campus spaces or serve as protective barriers. Many fence types are common to New England and can be effectively used to reinforce the regional character of the landscape and its unique sense of place. The following fence types are recommended for campus use:

Academic Core – White Two Rail Fencing



Fencing should be used with restraint within the academic core. When used it should consist of white two rail fences with the 4" square rails rotated 45˚ to form a diamond pattern. The height of fencing should vary according to the specific design intent and site conditions. The proportional relationship between rails and posts should be carefully considered. Fences should "run" level; avoid the use of fences in situations where the land slopes in such a fashion as to necessitate the fence stepping down across the landscape.

Posts should be native granite with a thermal finish. Interior posts should be a minimum of 5" square. End posts should be 8" square. Consider snow removal and snow storage when siting fences in the landscape and ensure adequate room for both. Fence posts should be set back a minimum of 18" from a paved surface to ensure adequate room for snow removal.

Agricultural Areas – White Rail Fencing

Within the agricultural areas of the campus, white four-rail HDPE fencing should be used to define paddock space and the edges of meadows and fields. Over the long-term HDPE fencing is cost effective, requires low maintenance, maintains its aesthetic appeal and is animal friendly. Fence posts should be a minimum of 5" square with a simple cap. Rails should be 2" x 6". Fences should be kept in good repair. Post and rail fences within the agrarian portions of the campus should follow the contours of the land, rising and dipping with changes in grade. Avoid situations that require the stepping of the fence to compensate for sudden changes in grade. Fences should be carefully sited in the landscape. Set fencing far enough back from the edge of the road to allow adequate snow storage and so as not to obscure a view of meadowlands.

Chain Link Fencing

In certain locations and for certain utilitarian functions chain link fencing is the logical choice because of its durability and effectiveness as a barrier. Where chain link

is required, black vinyl covered wire with black posts and rails should be used. Chain link fencing is appropriate to locations where crowd control is required, such as adjacent to the athletic fields. When used as a protective barrier a landscape plan should be prepared that will obscure portions of the fence with landscape treatments or divert sightlines to lessen the fence's visual impact. Black vinyl fencing should be considered for construction fencing, especially within the academic core where extended construction will detract from the overall character and appearance of the landscape.

Screening Fence

Within the academic core and in other areas where screening is required to shield an offensive view and vegetation will not suffice, a white stained board fence should be used. Posts should be 5½" square bevel at the top with square edges. Smooth 5⅝" wide "V" groove boards with ship-lap joinery should be vertically mounted. Board fences should run level with the grade but in those instances where changes in grade preclude this, board fences should be stepped.

Landscape plans should be developed as a foreground to the fencing to reduce its scale and visual impact. As an alternative to board fencing, architectural walls can be used to screen utilities or objectionable views. Architectural materials should complement the architectural detailing of nearby buildings.

Site Grading

Site grading is an important design tool. A well-resolved grading plan can enrich the aesthetic character of a site. Grading can be used to screen objectionable views, enhance desirable views, provide sound control, direct circulation and reinforce the spatial definition of outdoor spaces. Site grading should result in a setting that is visually pleasant and in harmony with the existing scale and character of the campus. Grading plans should respect local and federal design guidelines relevant to the Americans with Disabilities Act and seek to make areas accessible to the greatest extent possible. When developing grading plans the following design criteria should also be considered.

Grading solutions should keep in mind winter conditions in Durham. Design solutions that rely on the use of salt or sand to reduce slippery conditions should be avoided. Grading solutions shall insure safe and efficient pedestrian and vehicular movement. Where a change in grade occurs along primary circulation route, designers should strive to resolve such situations with gradual slope transitions at less than 5%. Stairs should be used sparingly on campus since they

compromise accessibility and require hand shoveling.

To the extent possible, proposed grades should be kept as close as possible to the original condition of the site. Grading solutions should be developed to minimize site disturbance under existing vegetation especially within the root zone of trees greater than 4" in diameter. A Plant Preservation Plan shall be developed whenever a proposed project threatens existing vegetation, especially trees greater than 4" in diameter. Topsoil should be conserved whenever possible. It should be stripped, stockpiled, and reused to establish finished grades. The designer should strive to achieve a balance between cut and fill requirements.

Grading solutions shall consider future maintenance operations. New slopes shall be graded with gentle transitions at the toe and top of slope. Avoid acute transitions and slopes, swales, and ditches having a mechanical or engineered appearance. Strive to develop solutions that minimize periodic maintenance other than mowing operations on grass slopes and normal weeding and pruning on planted slopes. Designers should strive to limit slopes in lawn areas to less than 10%. Slopes mowed by vehicles should be 25% or less but in no case shall exceed 33%. Grass slopes in excess of 33% will necessitate hand mowing. Planted slopes, requiring periodic maintenance such as weeding, pruning and litter control should not exceed 3:1 (33%); slopes in excess of 3:1 shall be considered not maintainable on a routine basis. Unpaved slopes shall not exceed 2:1 (50%) or soil angle of repose whichever is less.

Site Drainage

Designers should strive to incorporate *Best Management Practices* (BMP) in the development of drainage solutions. The goal of a BMP is to control, store, and/or treat storm runoff on site while providing effective storm water management. A BMP for a specific site should integrate with the natural and built landscape while considering maintenance requirements, costs, and responsibilities.

Site designers should strive to include appropriate landscape treatments as integral components of a site drainage plan. Landscape practices such as vegetated swales, filter strips, basin landscaping and urban forestry practices preserve and/or enhance the aesthetic character of a site while contributing to an effective storm water management plan.

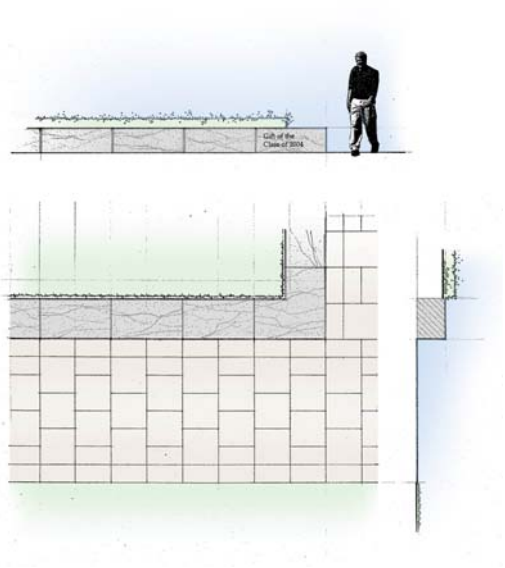
Erosion and sedimentation control are critical issues in the development of a storm water management plan. The use of appropriate erosion control practices can significantly reduce soil loss. Grass swales should be designed so that velocities do not exceed 4' per second for established bluegrass and 6' per second for tall fescue. If velocities exceed 6' per second,

use only approved non-vegetative material including geotextiles, placed stone or other approved methods.

All drainage pipes 'day-lighting' on slopes shall have headwalls. Headwalls shall be cast-in-place concrete, brick, or native stone construction. Material selection shall be determined based on architectural appropriateness. Provide diversion swales uphill from top of retaining walls to minimize overland flow of water over wall surfaces.

The size, shape, and location of drainage grates shall relate to unit paver size and conform to shape of the paving pattern. Utilize round raised grates when installed in lawn areas. Drainage grates shall be carefully located with respect to pedestrian traffic, allowing for safe travel. Slots shall be a minimum of ¼" wide and shall not exceed 5/16".

Gifts and Memorials



Campus memorials commemorate the lives of former students, faculty, staff, and other persons who have had a lasting impact on the University. Memorials and gifts often serve as the catalyst for the development of new campus open spaces and landscape projects. Memorial landscapes often include seating, artwork, planting and other landscape amenities. Memorials serve to remind us that our time at the University is fleeting and whether we are students, faculty, staff or stewards our obligations are not only to address the concerns of the present but also to honor the obligations of the past and preserve opportunities for the future. Stewardship programs that endow existing landscapes such as the Ravine should be encouraged as a desirable alternative to the installation of gifts or memorials.

Memorials should be carefully sited in the landscape. Consideration shall be given to the long-term development of the campus. Consult the Campus Master Plan prior to the placement of all memorials.

Living memorials such as trees, gardens, and woodland groves should have a maintenance endowment assigned them. The assignment of an endowment shall be at the discretion of the University and may be required as part of the gift. It is the policy of the University to avoid the placement of memorial plaques. A book containing a list of campus memorials is available for public viewing at the Diamond Library.

The placement of memorials should consider routine maintenance concerns such as mowing and snow removal.

Section 5. Planting Guidelines

5. 1. Section Introduction

In the development of a viable and sustainable planting plan it is important to draw distinctions between aesthetics and those issues related to landscape performance. How well a landscape and its "natural" systems function is the true determinant of its sustainability. Sophisticated planting design can facilitate the performance of a landscape by ensuring that natural systems are protected and continue to function before, during and after construction. Ideally, planting designs will enhance the performance of natural systems by correcting previous mistakes or negligence or by improving "natural" habitat. Fundamental to the improvement of habitat is the reconnection of isolated landscapes and ecosystems.

Planting designs should strive to increase biodiversity on a campus wide basis by repairing damaged ecosystems, revitalizing depleted habitats and increasing the species diversity of campus plantings. However, it is important that biodiversity be understood and achieved in the context of the entire campus. The goal should not be to indiscriminately add new species or cultivars to the campus but rather to add those species that have been diminished or lost and that are or were critical to the functioning of campus ecosystems. Resolving to increase biodiversity through formulaic designs within individual installations may address philosophical goals and add new species to the list of campus plants but, in reality, may do little to enhance the environment within the framework of the entire campus.

Function and practical application aside, another goal of landscape planting is obviously the visual enrichment of the landscape. Natural systems and features, such as woodlands, meadows and streams help define the "natural" character of the campus. Preserving and enhancing the "natural" landscape is fundamental to preserving and enhancing the identity of the campus and its unique sense of place.

As the campus landscape is rich in natural expression, it is also rich in cultural expression. Imprinted on the campus landscape are subtle vestiges that mark the evolution of the campus landscape and reflect the values of previous generations. It is important that design solutions are sympathetic to a site's legacy. Design solutions should respect a site's historic integrity not for the sake of nostalgia but because a site's history can inform the future. Contemporary designs that do not respect a site's historic fabric risk altering its character and diminishing the overall richness of the campus. It is important that as planting designs are composed the preservation of the cultural landscape is prioritized. It is important that landscape

plantings be compatible in style with the established character of the adjacent landscape and the surrounding architecture that define its spaces.

Planting design can also facilitate landscape performance through thoughtful design decisions with regard to the long-term management of the landscape. Plants should be selected based on their ability to not only survive but to thrive under campus conditions. The selection of appropriate plant material and the design of functional systems lower long-term management costs associated with the upkeep of campus planting. The University can realize substantial savings in the management of the campus landscape if plant material is chosen carefully. Savings can be realized in reduced operational and maintenance costs. However, the goal should not be to simply reduce management costs but to reallocate current expenditures into other areas of landscape management to foster a further increase in savings and a higher return on the investment in the landscape.

The following section establishes guidelines for the development of planting designs and selection of plant material appropriate to the university landscape.

5.2 Plant Selection

The selection of plant material appropriate to the University campus is as much an art as a science. It is a thoughtful process in which aesthetic, functional and environmental concerns and issues related to the long-term management are equally considered. In the final analysis one factor might outweigh the others but it is important that the designer understand the full impact of his/her planting recommendations. The following factors should be considered when selecting plant material suitable for the UNH campus.

Purpose of Planting

Architectonic: The spatial definition of outdoor space is a primary consideration in the development of a planting design. Plants should not be used as merely exterior decoration. Plants have mass, scale and density and when used thoughtfully they can and should be used to spatially define an outdoor path or place. Consideration should be given to the effective use of tree canopies to create a perceived ceiling, arching canopies to reinforce entry, tree trunks as columns, walls, and gateways. Consideration should also be given to the use of shrubs as walls to create or reinforce spatial divisions.

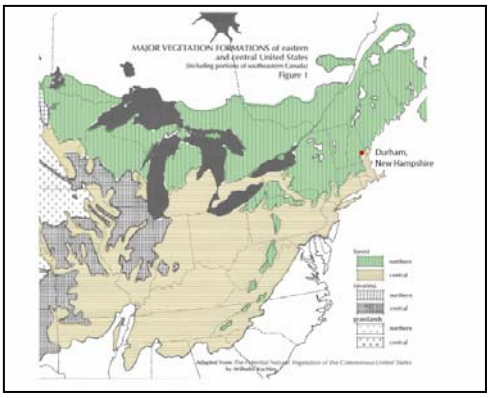
Climate Control: The selection of plant material can have a significant impact on an area's microclimate. Planting can moderate temperatures within a space by reducing solar

reflection and absorbing heat during the daytime and slowly releasing it at night. Plants can be used to augment natural airflow by reducing wind speed and blocking harsh winter winds while channeling cool summer breezes. Masses of plants can measurably increase humidity within a space fostering a more suitable growing environment.

Engineering: Plants are the most effective way of reducing or eliminating soil erosion. Trees, shrubs and groundcovers intercept rainfall and reduce splash erosion. Root systems form fibrous networks that help maintain soil structure and decomposing leaves increase the organic content of the soil thereby increasing its water holding capacity. Plants are also effective in reducing wind erosion.

Plants serve limited role in noise abatement by helping to deflect and absorb sound waves. Plants are often affective in controlling pedestrian traffic across campus. Hedges, either formal or informal, can successfully redirect pedestrian flow. The strategic placement of 3 – 5 ornamental trees can be equally effective, require less long-term maintenance and in some cases be aesthetically superior.

Plants are also effective in screening unattractive or objectionable views such as parking lots and utilities such as dumpsters and transformers. Plants should be planted along the edges of parking lots to screen the view of the cars but also to reduce or eliminate problems associated with glare and reflection from parked vehicles.



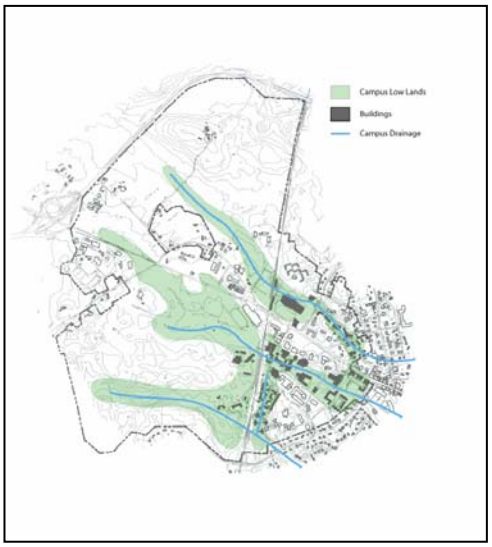
Campus Aesthetics: The most obvious use of plant material is in the visual enrichment of the campus landscape. Their flowers add color to the landscape; their foliage adds texture and scale. Plants can also be used to stimulate other senses; flowers, fruit and even foliage are often aromatic and perfume the air with pleasing scents. The wind whispering through the pines or rustling autumn foliage provides a pleasant audio background that can be effective in masking disruptive or displeasing sounds.

Aesthetically, plants can also be used to reinforce character and enhance a regional sense of place. The University campus is located on the edge of the Northern Forest and Central Hardwood Forest. Conifers such as pine, fir and hemlock typify the Northern forest whereas oaks, beeches and maples are endemic to the Central forest. Associated with this is a multitude of shrubs, grasses, groundcovers and wildflowers that comprise the understory and groundplane of these forests. This diversity affords a designer great deal of latitude in the selection of “native” species appropriate to the University’s landscape.

Plant Suitability

Suitable Habitat: In "natural" settings, plants tend to grow in communities that share similar habitat requirements. Factors that influence habitat include climate, light, humidity, precipitation, and air movement. Plant distribution is also influenced by soil characteristics, such as texture, structure, depth, moisture capacity, drainage, nutrient content, and topographic position. Within any given region where habitat is held in dynamic equilibrium, tree stands of fairly homogeneous composition consistently recur. This integral relationship of plant and habitat represents the maximum utilization of available environmental resources.

The over riding environmental factor determining the disposition of plant communities is plant available soil moisture. Moisture availability is dependent upon soils but also on topography. Topographic gradient is commonly divided into two series, lowland and upland. The combination of soil moisture availability and topography has resulted in the delineation of five categories:



1. **Lowland wet:** Areas subject to frequent flooding, high water tables and poor internal or surface drainage.

   Plants that typically grow within this region include: Red Maple, Alder, Grey Birch, Pin Oak and Larch.

2. **Lowland wet-mesic:** Areas of intermittent flooding of short duration, characterized by excess surface wetness in winter and spring to nearly xeric conditions during the mid-summer low water stages.

   Plants that typically grow within this region include: Hackberry, Green Ash, Hawthorns, Catalpa and Honeylocust.

3. **Upland mesic:** Wet ravines and sheltered coves, moist but well drained slopes and uplands, generally north and east facing slope aspects, protection from direct sun exposure and prevailing dry winds.

   Plants that typically grow within this region include: Sugar Maple, Shadblow, Beech, and Sweetgum.

4. **Upland mesic-dry:** Dry slopes and upland flats, generally warmer south and west facing slope aspects, upland ridges and ravines.

Plants that typically grow within this region include: White Fir, Black Walnut, Tuliptree and White Oak.

5. **Upland dry:** High banks, calcareous water worn cliffs, steep rocky land, excessively drained sandy soils or shallow stoney soils over rock outcrop.

   Plants that typically grow within this region include: Eastern Red Cedar, Jack Pine, Pitch Pine, Staghorn Sumac and Black Locust.

Each of these areas is represented on the University campus even within the central core of the campus where decades of construction have irreversibly altered the "natural" habitat. A careful analysis of a planting site will reveal site-specific conditions that reflect each of these habitats providing valuable insight into the selection of plant material appropriate to a specific campus situation.

5.3 Planting Design Guidelines

Plants are living entities and their installation on campus implies a long-term commitment in terms of time and money. It is essential that design, installation, and management programs are coordinated to insure the long-term vitality of the campus.

The following section focuses on planting design and the thoughtful and artistic arrangement of campus plants. It offers some insight into the role that trees, shrubs, and flowers serve on the campus. The section also presents some thoughtful guidelines for strengthening the spatial definition of the campus and enriching special character.

Campus Trees

Trees are the backbone of the campus landscape. Spatially they define its streets and open spaces and they provide seasonal interest through their flowering, fruiting and autumn foliage. The University campus has a wonderful collection of native and exotic trees. The tree inventory records almost 2500 trees representing over 150 different species.

- Wherever feasible, the practice of planting trees along all campus walks and roadways should be encouraged.
- Trees planted to frame and spatially define roads should be of a single species. The consistency of character derived from a single species unifies the streetscape and creates a more harmonious effect in the landscape.
- Trees should not be indiscriminately planted throughout

the campus. Careful attention should be given to spatial definition and aesthetics, as well as its influence on the local microclimate.

- When developing planting plans, consider the eight S's related to the roles that plants serve in the landscape. The eight S's are shelter, screening, seclusion, shade, scale, structure, style, and sculpture.
- When planting trees in clumps, use odd number combinations of 3, 5, 7, and 9. Avoid using even number combinations. When planting trees surrounded by pavement make adequate provision for root growth. Use CU-Soil or equivalent structural soil to ensure a suitable root environment.
- Structural soils (CU-Soil and equivalent) facilitate reasonable root growth in urban conditions. Use structural soils continuously throughout the root zone.
- Ensure adequate drainage and aeration of the soil environment for all trees planted under "urban" conditions. If necessary incorporate drainage tiles into planting details to avoid saturated conditions following rainstorms.
- When planting trees in paved environments (plazas) separate planting and walking areas to minimize root/paving conflicts.
- Plant beds should contain adequate soil volume to allow for adequate root growth.
- When planting trees in lawn, maintain a circular mulched bed, (8' dia.) for a period of 4 – 5 years.
- When planting trees in mass, strive to use native trees of the same species or combinations of species having similar characteristics.
- Plant groups of trees in lines, triangles, or wedges to get the maximum effect from the massing of their foliage when mature. Avoid planting trees in circular patterns unless dictated by the design.
- Lightly structured trees with dramatic silhouettes such as birches and Fringetrees are effective in the foreground because they help frame the view beyond.
- Trees with solid canopies such as oaks, beeches, and evergreens should be used to terminate views.
- The campus is a living laboratory; efforts to increase plant diversity should be supported. However, trees extremely unusual in form, leaf color or structure, should be used with restraint. Preservation of campus character should override considerations for diversity.
- A tree tag noting common name, botanical name, and scientific family of each species should be clearly mounted on representative specimens.

Street Trees and Parking Lots

- Planting street trees in the area between buildings and sidewalks provides an optimum space for street trees.
- When planting street trees in esplanades make adequate

provision for root growth. Plant beds between the sidewalk and street should be prepared as a continuous planting bed to provide adequate soil levels for root growth.

- Esplanades for street tree planting should be a minimum of 6' wide. Strive for esplanades of 8' – 10' wherever possible.
- Species selected for streetscapes and parking lots should be resistant to salt damage. Consider species such as Green Ash, Blackgum, and to a limited extent, exotics such as Austrian Pine.
- When planting trees in a linear fashion use a continuous trench method for planting, avoid individual tree pits that may not be large enough for long-term growth.
- When selecting street trees consider the mature height and massing of the tree. Avoid the use of large trees under power lines and overhead equipment.
- Street trees should be spaced approximately 30 – 40 feet on center depending on site-specific conditions and design intent.
- Street trees planted in lawns adjacent to sidewalks and other paved areas should be sited a minimum of 8' from the edge of the pavement.

Evergreen Trees

- Conifers should be planted thoughtfully. White pines, hemlock, firs, and spruces should be planted in groups (a minimum of 3).
- If individual evergreen specimens are desired, there placement should be carefully composed and related to the greater campus to avoid inadvertently screening significant views, or creating adverse micro-climates.
- Avoid the placement of conifers along the north side of campus walks and drives where their shadow prevents the melting of ice and snow.
- Conifers, if judiciously planted can enhance the winter landscape. Site evergreen groupings where there mass and scale terminate winter views.
- When siting conifers for winter effect site them to be seen across open expanses of lawn where the white foreground of snow contrasts against their deep green foliage.
- Conifers should be planted in combination with deciduous trees and shrub masses to create windbreaks and snowbreaks.

Flowering Trees

- Shadblows (Amelanchier sp.) are common to the New England and should be used often in campus plantings to reinforce a sense of place and help unify the campus, especially during periods of bloom.
- Consider using other flowering species with restraint. If

used judiciously the effect of these specimens is more dramatic.

- When planting flowering trees in clumps, use odd number combinations of 3, 5, 7, and 9. Avoid using even number combinations.
- When flowering trees are selected as a focal point, consideration should be given more to the tree's structure and its influence on the microclimate than on its flowering characteristics. The tree must carry its design weight four seasons of the year and not just when in bloom.
- Flowering trees planted in a grid, "orchard" style, can create significant spaces in nondescript landscapes. Consider the installation of "orchards" in areas where open fields are poorly defined or are serving no specific purpose.
- "Orchards" create destinations in large landscapes. They are attractive and often draw students, faculty, and staff to areas of the campus seldom seen. Consider the installation of "orchards" in the development of the grounds to serve as picnic groves, outdoor classrooms, and living laboratories.
- Trees should be selected for their flowers in the spring, fruit in the summer, colorful foliage in the autumn, and attractive bark in the winter.

Shrubs

- Shrubs play an integral role in enriching the campus landscape. They are used to create green walls; for their flowering or fruiting characteristics; and to screen objectionable views.
- Shrubs are important in restoring "natural" landscapes by stabilizing eroded slopes and by providing shelter and food for wildlife.
- Shrub selection should be based on the year-round contribution the plant is to make in the landscape. Care should be taken to avoid selecting shrubs based solely on the beauty of their flowers.
- Shrubs used in mass should be of the same species. Avoid creating awkward combinations that result in a clash of color, form, or texture.
- Shrub planting around the base of buildings should be done with restraint. Selection should be based on the mature size and character of the plant.
- Shrubs should be planted judiciously around dormitories and residential buildings. Care should be taken not to plant shrubs near first floor windows or building entrances.
- Shrubs shall be judiciously planted near walkways and parking lots. Avoid situations that may obscure visibility or limit surveillance.
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Hedges

- Hedges can be formal in character, such as clipped yew or hemlock hedge. They can also be informal in character, such as a viburnum or lilac hedge. Both treatments are appropriate to the University campus.
- Evergreen hedges require expert pruning. Evergreen hedges should taper towards the top to allow plenty of light to reach the sides.
- Hedges serve as "green walls" in the landscape. They should be used to spatially define outdoor spaces.
- Hedges are also effective in screening objectionable views. However, the height of the shrub should correspond to the height of the object to be screened. Avoid planting hedges that are excessively high, they are difficult to maintain.
- Hedges, like walls and fences, are effective in modifying microclimates in the garden. Hedges should be used to protect tender plants from cold, desiccating, winds. The judicious use of shrubs and hedges can significantly increase the variety of plant material suitable for campus gardens.
- Hedges can be effective in guiding pedestrian circulation. However, when planting hedges to reroute existing traffic patterns it may be necessary to reinforce the planting with a post and chain detail until the hedge has become established.
- When selecting material for hedges it is best to plan for the long term. Classic hedge plants like yew, box, and holly are often slow to establish but require minimal pruning when mature. Faster growing material such as privet and honeysuckle are quick to establish but require frequent pruning to keep them in check.

Groundcovers

Groundcovers are inclusive of annuals, perennials and vines. They are important components of a landscape design. Whereas trees and shrubs provide structure, groundcovers are effective in adding color and character to the landscape. They serve in the foreground of a planting composition and when planted in mass can cause a space to appear larger. They are also important in reducing maintenance demands by providing a thick layer of vegetation that suppresses the growth of noxious weeds.

Basic Design Considerations

Campus Gardens

- Priority should be given to refining and improving existing gardens before new gardens are developed on campus.

- Gardens should be designed to provide year-round interest. Consider the effects of flower stalks, dried foliage, and fruiting bodies in the winter landscape. These elements often add interest and character in an otherwise drab and lifeless environment.

Perennial Beds

- Perennial beds should be developed along the edges of landscape spaces. Avoid the design of "island beds" that compromise mowing operations.
- Strive for season long bloom in perennial beds. Develop themes such as the "white garden" or "red garden". These help organize and inspire a harmonious design for a garden. Moreover, themes help identify gardens and reinforce their own sense of identity.
- Develop mass plantings of herbaceous plantings such as daylily beds in conjunction with hedges and other landscape elements. Combinations of perennial beds and hedges or fences can be an effective treatment to screen parking lots and other objectionable views.
- Bulbs such as snowdrops and crocus are harbingers of spring. Encourage their liberal use in perennial and groundcover beds.

Annual Beds

- Use restraint in the development of flowerbeds and garden areas adjacent new buildings. The design, style and character of contemporary architecture are not always suited to elaborate flowerbeds. Encourage the use of container plants on terraces and gathering areas.
- Where practical rotate flower arrangements in container pots to reflect the current season.
- Consider the use of container plants sited strategically throughout the campus to add color and seasonal interest, especially in areas where it is not practical or desirable to install permanent flowerbeds.

Groundcover Beds

- Consider the use of groundcovers to reduce the amount of mowed areas on campus. Not only is such a practice ecologically friendly its dollar and cents practical.
- Strive to eliminate small areas of turf that are often residual space left over from previous development projects. A mass planting of a low

maintenance plant such as Hosta or daylily can, at minimal expense, enrich an otherwise drab and forlorn space.

- Consider the development of groundcover beds in areas where grass seems to struggle, such as under shallow rooted shade trees.
- Consider the use of groundcovers or combinations of trees, shrubs, and groundcovers on steep banks that are difficult or dangerous to mow. Lower long-term maintenance expenses can often offset initial installation costs.

Vines

- Consider the use of climbing vines on large blank walls. Climbing vines, if well maintained, do not present a threat to block walls.
- Consider the use of vines on wire trellis to create spatial divisions in gardens and landscape spaces. "Green walls" can be dramatic and if used thoughtfully can compliment contemporary architecture.
- Consider the use of rambling vines to cover large areas where the unit costs associated with typical ground covers would be prohibitive.

Landscape Management

Landscape projects should be aesthetically pleasing and functional while being affordable to install and to maintain. Avoid the use of products and systems that are cost prohibitive to install or excessively expensive to maintain. Long-term maintenance should be a primary consideration in the development of all landscape plans. Consider the "after life" of the project, that period following installation when the long term care of planting or facility begins.

General Considerations

- The finish grade of lawn areas adjacent to walkways should be a minimum of 1" below the surface of the walk.
- The use of steel, plastic or aluminum edging to delineate plant beds should be avoided.
- Mowed areas should have a minimum clearance width of 62" to allow the passage of the smallest hand mower.
- Immediately remove graffiti and repair damaged site furnishings to maintain a positive site character and pride of "ownership"
- Limit the use of concrete and brick due to the harmful effect that rock salt has on these products.
- Avoid the use of concrete walks or stairs in areas of deep shade or along the north side of buildings and tree massing.

- Freeze/thaw is a perennial problem; avoid the use of landscape details susceptible to this type of cyclical damage.
- Concrete landings should be integral to steps. Landings should be pinned to the top and base of stairs.
- All curbing on the UNH campus should be vertical granite curbing. When using raised curbs, adequate provision should be made for drainage; consider the use of scuttles within the curb line to allow water to sheet flow over adjacent surfaces.
- Avoid the use of drop inlets and area drains. Develop stormwater plans that encourage the sheet flow of water over lawn areas to allow for adequate infiltration.
- All site furnishings should be offset a minimum of 18" from campus walks.
- When designing sidewalk ramps for handicap access maintain a 5'2" plane of descent as opposed to the standard 4' width. The wider descent is easier to maintain.
- Avoid T-intersections along campus walkways. Intersections should have a minimum radius of 5'

Planting Considerations

- Trees with shallow root systems such as maples and beeches should be used with restraint in lawn areas.
- Trees with shallow root systems should be used with restraint near walkways, plazas, and other paved surfaces.
- Do not over plant. Allow reasonable room between new plantings to allow for maintenance access and to ensure plants are not overcrowded at maturity.
- When siting plant material give due consideration to growth habit and size of plant at maturity. Minimize future pruning and plant removal.
- Design lawn areas in a manner that facilitates mowing operations.
- Limit the sinuous design of walkways. When developing curvilinear walks, use only broad gentle curves.
- Ensure that easy access to lawn areas is provided in landscape designs. Avoid small grass areas not easily accessed by a riding mower. Limit hand mowing wherever possible.
- Trees adjacent to walkways, plazas, and parking lots should not create litter that can compromise the safety or comfort of pedestrians. Weak wooded trees should be avoided near walks and in parking lots.
- Trees specified for the University campus should be resistant to disease and not prone to serious insect attack. If trees with such attributes are deemed desirable for collection purposes, they should be planted with restraint and only with the approval of the Campus Planner.
- Thorn trees or trees whose flowers attract large numbers of bees and stinging insects such as Basswood should not be planted near walkways, plazas, or parking lots where

large numbers of people gather.

- Flowering trees, especially fruit trees, should be expertly pruned.
- Avoid the overuse of shrubs and perennial borders.
- Limit the use of sheared hedges on campus. In areas where a hedge is appropriate consider the use of informal hedges or plant material that requires minimum pruning to maintain hedge character.
- Prune trees, hedges and shrub masses annually to prevent overgrowth that may reduce visibility or detract from the general appearance of the space.
- Individual shrubs should be pruned with restraint. Consider the shrubs inherent growth characteristics, avoid excessive pruning that results in topiary that requires annual pruning.

Snow Removal

- Adequate provision should be made for the storage of snow in all site designs. Snow removal management should not be predicated on the removal of snow from the site.
- Plant material should be carefully placed in the landscape. Allow adequate room for snow removal.
- Avoid setting plants closer than 18” to pavement where damage to trees or shrubs from snow removal operations may be a concern.
- To adequately allow for snow removal, a 6’ wide sidewalk should be the minimum width of all campus walks and trails maintained throughout the year.
- Avoid the design of curvilinear walks with tight or erratic curvature. Walks with tight curves are difficult to maintain in the winter without damaging the adjacent lawn.
- Strive to limit the use of “rock salt” in non-essential areas. “rock salt” should be mixed with sand to improve traction. Minimize the amount of salt to the smallest amount possible.
- The use of straight sand is preferable in areas where pedestrian traffic or steep grades and other site-specific conditions do not warrant the use of salt.
- The use of less caustic (though more expensive) snow melting materials such as calcium chloride should be considered where salts are causing excessive damage to concrete or to sensitive planting areas.
- Strive to keep entry walks free of salts to reduce tracking of residue into the building.

Section 6. CAMPUS STANDARDS

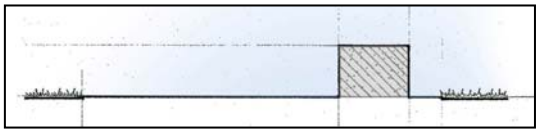
6.1 Section Introduction

The use of standardized site furnishings contributes to a harmonious and cohesive campus landscape. The following site furnishings and design details should be specified on all landscape projects on the Durham campus.

6.2 Site Furnishings

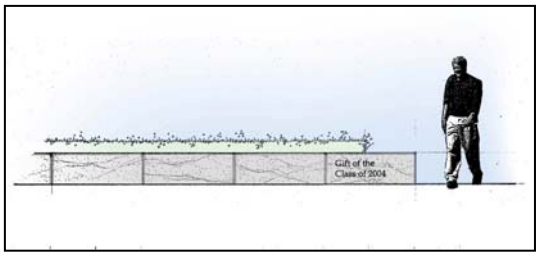
Campus Benches

Granite Pedestals



Granite pedestals should gradually replace the existing granite benches in the core of the campus. Granite pedestals should be cut from native stone and supplied by local sources. The granite pedestal should comply with the following minimum standards:

Height	=	17" minimum (17" – 19" preferred)
Width	=	varies according to how the pedestal is to be used in the design
Length	=	varies according to how the pedestal is to be used in the design
Finish	=	varies according to design



This concept offers great versatility and can be modified to meet a wide range of design criteria. 17" is an ideal seating height. Varying the width and length requirements provides great design flexibility. The pedestal can vary from being a simple cube designed to accommodate an individual to a bench 17" high by 3' wide to 6' long designed to accommodate a group.

Furthermore, there will be great versatility as to how the bench is used in a design. For instance, the pedestals can be used as floating objects in a plaza, they might provide a strong edge to a walkway or they might serve as raised coping holding back a small grade. This structure could also serve other uses; a square block 3' x 3' might not only serve as bench it might serve as "soap box" or stage.

Also the concept offers great versatility as to the finish and detail that could be obtained. The edge might be thermal cut, split face, or polished. A reveal or chamfer might be incorporated into the design to dignify a memorial. Text could be incorporated along the edge or, if done carefully, on the top.

Teak Benches

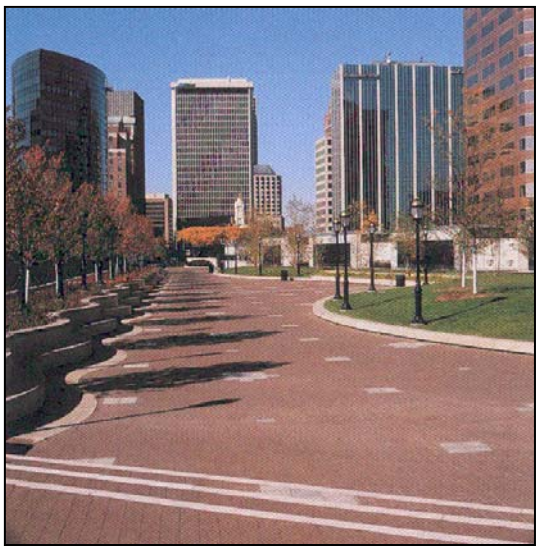
Teak has traditionally been used for high quality outdoor furniture. It is durable and long lasting. When exposed to the elements it resists rot, splitting, buckling and insect infestation. Unfortunately, its irresponsible harvest from endangered rain forests has cast negative connotations on its general use.

However, the use of environmentally harvested teak, from the island of Java offers a responsible alternative. Stringent government regulations control the production of the island's teak. Trees are harvested in 30-40 year cycles and adhere to strict environmental policies that ensure the long term renewal of this resource and a stable economy for citizens.

Teak benches are comfortable and are appropriate in locations such as gardens, memorials and other sites where people seek peace and quiet contemplation. Teak benches complement the aesthetic character of the central campus and reinforce its sense of place. Teak benches should be used with restraint on campus and be reserved only for special areas within the central core of the campus.

Manufacturer:	Kingsley-Bate 7200 Gateway Court Manassas, VA 20109 t. 1-703-361-7000 www.kingsleybate.com
Model:	Hyde Park Bench
Size:	6" Length
Finish:	Teak

Manufacturer:	Country Casual 9085 Comprint Court Gaithersburg, MD 20877 t. 1-800-284-8325 www.countrycasual.com
Model:	Monarch Bench
Size:	6" Length
Finish:	Teak



Asphalt Unit Pavers

Asphalt unit pavers are a unique paving alternative to concrete or brick pavers. Asphalt (Hanover) pavers are extremely durable, resistant to salts and mineral oils, do not absorb moisture, offer excellent slip resistance, do not deflect or dent, come in a variety of shapes, sizes and colors, can be removed and replaced, absorbs heat in the winter (which helps melt the snow), are tolerant of heavy vehicle loads (do not settle), are very tolerant of the snow plow and other maintenance equipment, are comfortable to walk on, and are aesthetically acceptable. Asphalt pavers should be considered for primary walkways throughout campus.

Manufacturer:	Hanover Architectural Products 240 Bender Road Hanover, PA 17331 t. 1-717-637-0500 www.hanoverpavers.com
Color:	#A80011, #A80013, A80016 (blend)
Size:	8” x 8” x 2”, 4” x 8” x 2”
Finish:	Ground/Tudor®

Concrete Unit Pavers

Concrete unit pavers are an attractive paving alternative to asphalt or cast-in-place concrete sidewalks. Concrete pavers have been used on campus and have proven to be durable, resistant to salts, offer excellent slip resistance, and can be removed and replaced, and if installed properly are tolerant of heavy vehicle loads and snow plows. Concrete unit pavers should be considered for secondary walkways throughout campus.

Manufacturer:	Hanover Architectural Products 240 Bender Road Hanover, PA 17331 t. 1-717-637-0500 www.hanoverpavers.com
Paver:	Traditional ® Prest® Brick
Color:	Quarry Red or Limestone Gray
Size:	Varies according to use

Alt. Manufacturer:

Pavers by Ideal
Waltham, MA
t. 1-781-894-3200
www.idealconcreteblock.com

Bike Racks

The University is encouraging the use of bicycles on campus. Many individuals use their bicycles throughout much of the year, extending the bike riding season well into the autumn and early spring. Bike racks should be sited in convenient and well-lit locations. Bike racks should be located in close proximity to building entrances to facilitate their use and to discourage the random placement of bikes adjacent to stairways, light poles and other campus furnishings.

Manufacturer:	Function First, Bike Security P.O. Box 882 Corvallis, Oregon 97339 t. 1-888-245-3742 www.bikerack.com
Model:	The Bike Rib Series (I, II or III)
Color:	Black, Polyester Powder Coat
Finish:	Wrinkle Finish

Trash Receptacles

Trash receptacles are an essential component of the campus landscape. Like other landscape elements they should be compatible with the scale and character with other site furnishings. They must also be durable and resistant to damage from vandalism (as well as damage from routine maintenance). Trash receptacles should be strategically located near building entrances, intersections of walkways, drop-off areas, bus tops. Trash receptacles should be set at least 18" from the edge of the walk to be clear of snow removal operations.

Manufacturer:	Rubbermaid Commercial Products 3124 Valley Avenue Winchester, Virginia 22601 t. 1-540-667-8700 www.rcpworksmarter.com
Model:	4021 Weathergard SeriesTrash Receptacle with 32 gal. Brute Container Rigid Liner
Color:	Black
Finish:	UV-stabilized Powder Coat Finish

Bollards

Granite Bollards

Granite bollards evoke the regional character of the landscape and should be used throughout the campus to define landscape edges, gardens and to discourage undesired pedestrian flow across lawns. Granite posts should not be sited where there is a risk of being hit by snowplows. Granite bollards can be sited individually, as freestanding elements or connected with a chain to create a barrier.

Posts:	Native granite (set approximately 7'6" apart)
Size:	6' x 8" x 8", 3' exposed. (larger sizes when architecturally appropriate)
Finish:	Thermal finish, radius corners, pedestal and top.
Chain:	⅜" hot dipped galvanized, painted black
Bolt:	Eye bolt ½" dia. 5' long

Steel Pipe Bollards

Concrete filled steel bollards should be sited in utilitarian areas of the campus where aesthetics is not critical such as service areas. Steel bollards should be sited near corners of buildings threatened by vehicular traffic such as snowplows, delivery trucks and service vehicles.

Pipe:	6" – 10" dia. steel pipe
Size:	6' length, minimum 3' exposed.
Finish:	Iron Oxide Red – Prime Paint
Finish Color:	Black
Chain:	⅜" hot dipped galvanized, painted black
Bolt:	Eye bolt ½" dia. 5' long,

Campus Lamps

Light has the ability to transform the character of a space. A sophisticated lighting scheme can enrich the evening campus. While it is important that lighting creates a safe and comfortable environment, it is equally important that the style, scale, and character of

the lighting fixture be compatible with the desired image and identity of the campus.

Pedestrian Lamps

Manufacturer:	Sternberg Lighting 7401 Oak Park Avenue Niles,Il 60714 t. 1-800-621-3376 www.sternberglighting.com
Model:	1910 508 RLM
Color:	Black
Post:	12’ Cast Iron

Parking Lot & Street Lamps

Manufacturer:	Kim Manufacturing P.O. Box 60080 City of Industry, CA 91716 t. 1-626-968-5666 f. 1-626-369-2695 www.kimlighting.com
Model:	The Archetype, AR or SR (depending on application)
Color:	Black
Post:	Tapered Steel or Aluminum (depending on application)
Color:	Black

SECTION 7. LANDSCAPE IMPROVEMENTS

7. 1 Section Introduction

The recommendations contained herein seek to enhance the established landscape by guiding its renewal and rejuvenation. The recommendations also seek to enrich the evolving landscape with the addition of new landscape spaces. The recommendations are organized according to three categories. Section 7.2 deals with the refurbishment of the built landscape and the restoration of its natural systems. Sections 7.3 and 7.4 address improvements to pedestrian circulation systems and the creation of new campus spaces designed to accommodate the social, cultural and aesthetic needs of an expanding campus and university community.

7.2 Campus Renewal

The Durham campus is 110 years old. Although the campus has aged gracefully, many of the trees planted during the 20's, 30's and 40's are reaching maturation and in some cases, beginning to decline. Shrubs and foundation plantings installed during the 60's, 70's and 80's have overgrown their boundaries and are in need of renewal or replacement. Tight budgets and deferred maintenance over the years has delayed the repair or replacement of broken sidewalks and courtyards and the toll of maintaining an expanding and complex landscape in Northern New England has also compromised the aesthetic condition of the landscape.

For the foreseeable future, tight budgets will continue to constrain landscape development opportunities and it is important that when those opportunities do present themselves, the funds are expended wisely and allocated to capital improvement projects that enrich the campus by creating new spaces that offer opportunity to improve pedestrian circulation and open space development.

In the meantime, it is important that the University begin a systematic renewal and rejuvenation of the established landscape, especially within the academic core. The following projects outline a plan of action aimed at revitalizing the campus landscape and subtly reinforcing its beauty and strong sense of regional character.

Tree and Shrub Replacement Plan

A review of the Campus Tree Inventory reveals that 15% of the campus' trees are in poor condition and another 35% are categorized as being in fair condition. 3% of the trees were listed as dead. This indicates that over 50% of the campus trees are not thriving or realizing their full potential in the landscape and may in fact, be detracting from the campus' character and aesthetic appeal. Furthermore, a cursory field

assessment of campus shrubbery noted instances where shrubs were dead or declining and in need of removal or replacement. In several cases it was noted that some shrubs had become overgrown and no longer served their original design intent.

An occasional dead tree or shrub often goes unnoticed by those who experience the campus on a daily basis. But to the first time visitor the condition may be more insidious, especially when one considers the cumulative affect after a tour of the entire campus. While subtle, these conditions project a negative image of the campus that can adversely impact a visitor's first impression of the campus. It is important that the University implements a comprehensive tree and shrub replacement program to ensure the aesthetic integrity of the campus is preserved and enhanced in the coming decade.

Recommendations:

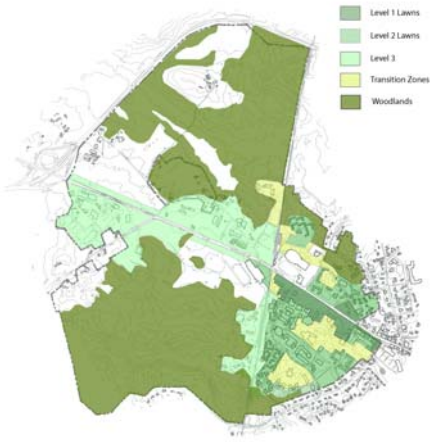
Update Campus Tree Inventory on an annual basis. Working closely with a Certified Arborist, the University should document the following.

Remove all dead trees as well as all declining trees whose removal is anticipated within three to five years. All dead, dying or diseased trees and shrubs within the academic core should be scheduled for immediate removal. The Inventory should also be expanded to include the notation of all dead, diseased or overgrown shrubs.

A Campus Tree and Shrub Master Plan should be developed to guide the scheduled replacement of affected trees and shrubs. The schedule should note anticipated removal dates and anticipated planting dates. The plan should also note the proposed location, botanical name, common name and size of replacement trees and shrubs.

In conjunction with the development of the Master-Planting Plan a detailed replacement budget should also be developed that projects removal costs, plant material costs and other costs associated with the installation of replacement plants. The budget should include projections for maintaining the plants (watering, pruning & fertilization) for a period of 18 months.

In addition to identifying trees targeted for immediate removal and replacement notation should be made of those plants in poor to fair condition that with remedial treatment can be rejuvenated. A management plan should be developed to facilitate their renewal.



Turf Management Plan

The quality of the lawns varies across campus. In general, campus lawns are well maintained and present an attractive and positive image of the University. The Great Lawn, the University's premier lawn, is generally free of noxious weeds and carefully mowed. While there are areas of the Great Lawn that tend to "brown out" under drought conditions, the overall appearance of the turf is positive. There are, however, lawn areas on campus that are in poor condition either due to poor growing conditions (not enough light), inadequate or inferior soils, or overuse (especially in the areas of the dorms) resulting in excessive compaction and poor performance.

One condition that is common to almost all the lawns on campus is the poor performance of the grass adjacent to sidewalks and driveways. Typically, the grass that lies within 18" of the pavement fails to perform adequately and each spring is barren of green growth until the area fills in with weeds in the late spring. This condition is due to a number of factors ranging from the caustic effects of rock salt and the mechanical damage incurred during snow removal operations to excessive compaction from foot traffic and the damage done by service vehicles that not only compact the soil but create deep ruts that are unsightly and impossible to grow grass in. Service vehicles also cause significant damage to the walks.

Enhancing the condition of campus lawns is a complex and challenging endeavor. Improving campus lawns is not only important with regard to campus aesthetics; it has significant financial and environmental implications.

Recommendations:

Conduct a comprehensive, campus-wide assessment of maintained lawn areas. Develop a Turf Management Plan using the assessment as a base reference. Based on the information gathered in the field, designate a series of turf management zones to guide the design, use and maintenance of these areas.

Implementation Guidelines

Classify campus lawns according to the following categories:

Level 1 Lawns: These are high profile lawns whose appearance is important to maintaining the traditional character and identity of the campus. These lawns require the most intensive management.

The management plan calls for the careful monitoring of these areas. An Integrated Management Plan (IMP) should be developed for these areas. An IMP is a comprehensive

approach to turf management and establishes guidelines for all aspects of turf management including mowing, irrigation, fertilization, aeration and weed/pest control. Level 1 lawns include the Great Lawn, the President's Lawn and the lawn in front of Scott Hall as well as those lawns heavily used for spontaneous recreation activities in the area of the residential dorms.

Level 2 Lawns: These lawns make up the bulk of the campus' lawns especially within the academic core and residential areas of the campus. While their appearance is important, they have a lower profile and can sustain a lower level of maintenance. Management recommendations should address the general care and cultivation of these areas and establish guidelines that inform general operations including a reduced mowing schedule, less fertilization and reduced weed/pest control. Where wear tolerance is not an issue, the University should explore the use of alternatives to Bluegrass, the typical seed mix used for campus lawns. Species such as the improved Hard Fescues should be considered since their management requirements are less demanding.

Level 3 Lawns: These lawns occur on the periphery of the main campus, primarily in the west campus. They require the least management. While their appearance is important, it is not necessary that they be maintained as traditional mowed lawns. Management recommendations include replacing traditional lawn with native grasses and wildflowers. This not only reduces labor costs and mitigates environmental impacts associated with maintaining these areas as lawn, it enhances habitat and improves the general aesthetics in these outlying areas.

Transitional Areas: These areas are currently maintained as lawns but lie adjacent to campus woodlands and groves. The condition of turf in these areas is usually substandard due to poorer soils, excessive shade or the gradual encroachment of native weeds. Management recommendations include ceasing all turf management practices in these areas and developing a plan that facilitates the eventual restoration of these areas to campus woodlands, groves and meadows. Management recommendations should also include the development of planting plans that facilitate succession by specifying plants and minor amendments to the planting area.

7. 3 General Refurbishment

In addition to removing and replacing dead, dying and diseased plant material it is important that the University implement a systematic upgrade of campus furnishings, especially within the academic core. Often considered a routine maintenance task the development of a formal refurbishment plan will ensure that worn, broken furnishings incompatible with the adopted campus standards are

systematically removed from the campus. The refurbishment plan should address all site furnishings including benches, bikeracks, trash receptacles, walls, fences, kiosks, and other miscellaneous site elements. The refurbishment plan should also address the orderly repair or replacement of broken and deteriorating sidewalks and other paved surfaces. Refurbishment efforts should prioritize the academic core of the campus as well as areas along College Road from where it intersects with Main Street to McDaniel Dr.

Recommendations:

Develop a Refurbishment Plan that focuses on the refurbishment of the academic core and the residential areas east of the railroad tracks.

Evaluate and record the location of all site furnishings noting their general condition. Make recommendations for either their repair, removal, or replacement.

Develop a detailed replacement schedule noting costs associated with the repair, removal and replacement, or disposal of obsolete or damaged site furnishings.

Develop a detailed plan for the systematic repair or replacement of campus sidewalks and paved surfaces. Note the design criteria required to bring the walk or court into compliance with new campus standards.

Remove dumpsters from along pedestrian walkways and gathering areas within the central core of the campus. In areas where dumpsters cannot be removed or relocated screen dumpsters with opaque screening devices such architectonic walls, dense landscape plantings or fencing.

7.4 Improvements to Pedestrian Circulation

Pedestrian circulation systems, i.e. sidewalks, trails, and pathways are important campus open spaces. They are the corridors that connect the separate areas of campus and help unify disparate spaces into a cohesive whole. While some corridors must accommodate limited vehicular circulation it is important that the scale of the walkway be of a pedestrian scale and be articulated with attractive site furnishings such as benches, lights, and trash receptacles and a pedestrian scaled paving. While pedestrian walkways are primarily designed to support cross campus circulation they also serve as important meeting and gathering spaces. The following proposals aim to enhance cross campus circulation by enriching the pedestrian experience.

College Way

The partial closure of College Way and the creation of a wide pedestrian path will facilitate east-west circulation. The long term plan calls for the extension of College Way under the railroad bed via a pedestrian tunnel. This will facilitate connections to the research facilities in west campus and dilute the perception of the railroad as a major impediment to unifying the campus landscape. Furthermore, the conversion of College Way to a pedestrian corridor diminishes the effect the street had on north-south circulation as well.

Recommendations:

Close College Way to through traffic limiting vehicular access to emergency and service vehicles. Allow for limited access from McDaniel Dr. to the Paul Arts Center.

Create pedestrian scaled gateways at the eastern terminus to College Way. Design the future pedestrian underpass in a manner that expresses gateway and announces the passage into a new area of campus.

Enhance the pedestrian experience through the addition of street furnishings such as benches, lighting, bikeracks, and other amenities.

Remove asphalt paving and the existing concrete sidewalk and replace with decorative asphalt paving units with concrete trim.

Explore opportunities for creating a variety of seating and gathering areas along or adjacent to College Way.

Enrich the pedestrian experience with new landscape plantings including street trees, ornamental trees and shrubs.

Facilitate north-south connections by recognizing the intersection of primary and secondary walkways that bisect College Way.

Demeritt Way

Demeritt Way is an important north/south corridor connecting the main campus and academic core with housing facilities in Forest Park and the Mini-Dorms. The plan calls for the extension of Demeritt Way in a southerly direction bisecting McDaniel Drive and terminating in the south in the area of the mini-dorms and in the north in Conant Courtyard.

Recommendations:

Keep Demeritt Way closed to vehicular traffic. Allow only for limited service vehicular use and emergency access.

Create pedestrian scaled gateways at the northern and southern terminus. Also create subtle gateway announcements at the intersection of College Way.

Enhance the pedestrian experience through the addition of street furnishings such as benches, lighting, bikeracks, and other amenities.

Remove existing unit pavers and unify with asphalt unit pavers and bands of concrete.

Explore opportunities for creating a variety of seating and gathering areas along or adjacent to Demeritt Way.

Enrich the pedestrian experience with new landscape plantings including street trees, ornamental trees and shrubs.

Facilitate east-west connections by recognizing the intersection of primary and secondary walkways that bisect Demeritt Way.

Carefully resolve the northern terminus of the Demeritt Way where it intersects with Conant Courtyard and Library Way.

Library Way

Currently Library Way terminates at College Road at the west end and behind Thompson Hall to the east. This proposal calls for the extension of Library Way in an easterly direction eventually terminating at the entrance to the MUB. In a westerly direction we are proposing to extend Library Way across College Road under the railroad tracks and onto the research facilities in the western portion of the campus. A spur connection will lead to the outdoor recreation facilities and the field house.

Recommendations:

Restrict vehicular traffic on Library Way to service vehicles servicing the Library and adjacent buildings. Reduce or eliminate existing parking in the area of Conant Courtyard.

Create pedestrian scaled gateways at the northern and southern terminus. Also create subtle gateway announcements at the intersection of Demeritt Way.

Enhance the pedestrian experience through the addition of street furnishings such as benches, lighting, bikeracks, and other amenities.

Remove existing concrete unit pavers and replace with asphalt unit pavers and bands of concrete.

Explore opportunities for creating a variety of seating and gathering areas along or adjacent to Library Way.

Enrich the pedestrian experience with new landscape plantings including street trees, ornamental trees and shrubs.

Resolve the western terminus of Library Way at the northern–most entrance to the College Woods Natural Area. Announce gateway to the Nature Area and College Woods.

East Promenade

As the east edge of the campus evolves develop a strong pedestrian corridor between the quadrangle in front of the MUB and the Christensen-Williams resident halls. This walkway should be designed and developed as a Primary Campus Walkway. In the near-term, provision should be made to limit vehicular traffic in this corridor and the walk should be developed in a manner that allows for the uninterrupted bisection of B-Lot across McDaniel Drive and down along Williams Drive terminating at the turnaround in front of Christensen Hall.

Recommendations:

Restrict vehicular traffic on the East Campus Promenade to service vehicles. Reduce or eliminate existing parking in the area of the resident halls.

Create pedestrian scaled gateways at the northern and southern terminus. Also create subtle gateway announcements at the intersection of College Way and the Huddleston-Mills quadrangle.

Enhance the pedestrian experience through the addition of street furnishings such as benches, lighting, bikeracks, and other amenities.

Remove existing asphalt and replace with asphalt unit pavers and bands of concrete.

Explore opportunities for creating a variety of seating and gathering areas along or adjacent to the East Campus Promenade.

Enrich the pedestrian experience with new landscape plantings including street trees, ornamental trees and shrubs.

Western Gateway

Concord Road/Main Street is a primary entrance to the campus. As is exists today, it is ambiguous and fails to create a memorable sense of arrival. The Landscape Master Plan calls for a series of improvements that will enhance

procession through the corridor, announce gateway, and reinforce a sense of transition from the agrarian and utilitarian edge of the campus into its central academic core.

Recommendations:

Improve wayfinding and directional signage. Establish campus signage standards that direct visitors to primary points of arrival, i.e. Visitor Parking, Admissions, and Extension offices.

Enhance the pedestrian experience along Concord Road/Main Street with streetscape improvements including street trees, site furnishings, well-lit pedestrian walkways and waysides with benches, bluelights and other amenities.

Develop a shared use path or bikeway that facilitates safe connections between the contrail core of the campus and the facilities and commuter parking facilities on the periphery of the campus.

Facilitate traffic management and calming by creating a roundabout at the intersection of Concord and Mast Road. Design the roundabout in a manner that serves as gateway and a threshold into the central core of the campus.

Enhance the roundabout/gateway with landscape improvements including signage, landscape plantings, lighting, and other site furnishings.

Screen objectionable views of utilitarian areas and unattractive features such as the horizontal silos, parking lots, and utility buildings in the Leavitt complex.

Develop landscape design solutions that eliminate the rip rock bank along the southern edge of Concord Road. Improve the bank planting or retain the slope with a combination of wall and landscape planting.

Ag-Way

As the agricultural facilities, greenhouses and Thompson School shift to the west it will be important to provide strong pedestrian connections to these facilities from the main part of campus. This plan calls for the development of a walkway that begins in the area of the future recreation fields and Greek Village and terminates at the agricultural facilities. This walkway should be primarily a pedestrian path but may evolve as a shared use path where it intersects with Mast Road Extension. A spur trail or walkway should be developed in a northerly direction to connect with the equestrian facilities and the horticultural facilities.

Recommendations:

Restrict vehicular traffic on the eastern portion between Mast Road Extension and the Greek Village. As the walkway extends to the west to connect with the agricultural facilities this walkway should be developed as a country lane.

Pedestrian and vehicular traffic should be separated with a green area containing street trees.

Create pedestrian scaled gateways at the northern and southern terminus. Also create subtle gateway announcements at the intersection of Mast Road Extension.

Enhance the pedestrian experience through the addition of street furnishings such as benches, lighting, bikeracks, and other amenities.

Explore opportunities for creating a variety of seating and gathering areas along or adjacent to Ag-way.

Enrich the pedestrian experience with new landscape plantings including street trees, ornamental trees and shrubs.

University Trail

The plan calls for the creation of a University Trail, a cohesive system that winds its way through the campus. In some areas the Trail will overlay existing circulation systems. Inspired by the University's Sustainable Trail Program, the University Trail will be designed to connect the academic core of the campus with the Northwest Woods, College Woods, downtown Durham, and outlying properties such as the Foss Farm, faculty and staff housing areas. The trail will be designed as a thematic trail designed to underscore and enlighten users to the University's comprehensive effort to promote a sustainable community. Through the use of consistent paving materials, site details, furnishings and interpretive signage, the trail will provide a unique opportunity to experience the campus' open space system.

Recommendations:

Limit vehicular traffic on the University Trail to service and emergency vehicles.

Enhance the pedestrian experience through the addition of street furnishings such as benches, lighting, bikeracks, and other amenities.

Explore opportunities for creating a variety of seating and gathering areas along or adjacent to University Trail.

Enrich the pedestrian experience with new landscape

plantings including trees, shrubs and flowerbeds.

7. 5 Open Space Enhancements

During the early phases of the master planning process it was noted that while the campus is strikingly beautiful there are relatively few outdoor areas conducive to public gathering. Aside from the Great Lawn there are few areas that can accommodate large groups gathering for pep rallies or other collegiate events. It was noted that when students do tend to gather it's usually on the east edge of the campus and activities quickly spill over into the downtown. It was also noted that while the campus is extensive there are relatively few areas that offer solitude and quiet contemplation. This plan proposes a series of open space developments aimed at addressing each of those needs.

Scott Lawn

Located directly across from the Great Lawn is Scott Lawn. This area was formerly the site of several tennis courts. These were relocated in the late nineties and a grove of trees has been planted in their place. Like the Great Lawn, Scott Lawn is a popular gathering place in the late spring, summer and early autumn. The area is sunken sitting several feet below the grade of the Main Street and the adjacent sidewalk creating an amphitheater-like affect. We believe this area has great potential to be developed as an area conducive to public gathering and assembly.

Recommendations:

Improve pedestrian access from Main Street. Consider the development of a large set of steps descending down into this space directly from the sidewalk adjacent to Main Street. Design the stair in a manner that they can also serve as seating, stage, and as an attractive focal point

Redesign the turf system to accommodate periodic assembly of large crowds. Improve site drainage and if necessary remove existing topsoil and replace with a modified soil mix more conducive to intense use. Install irrigation as required.

Enhance pedestrian access to this area from all sides. If possible develop grass slopes and ramps; minimize stair development. Install sidewalks as needed to accommodate increased pedestrian traffic.

Enrich the landscape with new plantings including shade trees, flowering trees and shrubs as well with the addition of street furnishings such as benches, lighting, bikeracks, and other amenities.

Define the edges and terrace slopes or if necessary

incorporate stone retaining walls at the base of steep slopes.

Conant Square

Conant Square located at the intersection of Demeritt Way and Library Way is an important pedestrian crossroads and campus social space. It has a southern exposure and is well protected from the harsh winter winds; therefore its use for campus gatherings and outdoor events can be extended into the early spring and late autumn. The square is the site of frequent social encounters and easily animated due to the presence of a food vendor. Unfortunately the presence of parked vehicles in the center of the space compromises its aesthetic and functional integrity.

Recommendations:

Reduce or eliminate vehicular parking within Conant Square. Resolve service and emergency access.

Resolve walkway and path alignments. Adopt appropriate paving materials and patterns.

Enhance the pedestrian character of this area with the addition of site furnishings such as benches, lighting, bikeracks, and other site amenities

Screen trash and utilities. Explore alternate methods of trash storage and disposal.

Enhance opportunities for seating and gathering. Explore opportunities to facilitate outdoor eating.

Resolve grading and drainage issues. Enhance the quality of turf within the square and identify opportunities to reduce maintenance demands associated with lawn maintenance.

Address snow removal and storage.

Enrich the landscape with new plantings including shade trees, flowering trees and shrubs and groundcovers.

The Dell

The Dell is an important campus open space. It serves as a primary arrival point for campus visitors, a major campus crossroads and a primary entrance to the Ravine. It is important that it project a positive image. Because of its geographical location on campus (close proximity to Thompson Hall, the library, and the MUB this area holds great potential to be developed as a central gathering area. At the same time its juxtaposition between the Ravine and the Great Lawn offers wonderful possibilities for creating a transitional landscape between the “natural” and the “cultured” campus landscape. Its relatively steep slopes

support the notion of limiting mowed lawn in this area.

Recommendations:

Develop a long term management plan that gradually allows the woodlands of the Ravine to transition up the hillside and envelope the existing parking lot adjacent Thompson Hall. This symbolically extends the Ravine to the edge of the Great Lawn and eliminates the current ambiguity of this space.

Realign and redesign walkways into and through this area. Accommodate the bisection of Library Way and establish a strong sense of gateway where the Lawn and the Ravine intersect.

Document the significance of the lilac collection remaining in this area. Determine what lilacs should be saved and relocated elsewhere on campus and what lilacs are expendable.

Explore opportunities to create seating and gathering areas. Explore possibilities to develop an outdoor amphitheater capitalizing on existing topographical conditions.

Enrich the landscape with new woodland plantings intended to accelerate the succession process. Examine ways to enhance habitat within this area.

Enhance the pedestrian character of this area with the addition of street furnishings such as benches, lighting, bikeracks, and other site amenities.

Address stormwater management. Currently there are several drainage structures that daylight at the top of this area. Examine ways to increase water infiltration on-site thereby reducing potential contamination of College Brook.

Memorial Union Building

Enhancing the landscape surrounding the MUB is important to creating a positive image of the campus grounds. Serving as the student center the MUB experiences one of the highest visitation rates of any campus building on any given day. Recent improvements to the north arrival area have not been complimented by similar improvements along the eastern or southern sides of the building. As construction nears completion on the new dining hall it will be important to reevaluate the landscape in front of the east side of the MUB in relation to the landscape newly installed at the dining hall. It will be important to upgrade the MUB landscape in this area to bring it aesthetically in balance with the surrounding landscapes.

In addition, the landscape along the south side of the MUB

offers wonderful possibilities relevant to the Ravine and the pedestrian corridor that bisects this area. However, unifying this side of the building with the greater landscape is challenged by the building's unique character, the large overhang in particular. However, the outdoor terraces and seating areas suggest some intriguing solutions.

Recommendations:

Enhance pedestrian walkways and corridors. Adopt paving details for primary and secondary walkways as appropriate. Reexamine walkway alignments to ensure the most efficient and pleasant pedestrian experience.

Enhance outdoor seating areas adjacent to the building and woodlands. Examine opportunities to create a woodland garden along the Ravine's edge opposite the MUB.

Explore opportunities to develop the landscape below the overhang by exploring landscape design notions that do not depend on plant material for enhancement. Explore opportunities to introduce artwork, sculpture or other design solutions that enrich this highly visible space adjacent to an important pedestrian corridor.

Enhance the pedestrian character of this area with the addition of site furnishings such as benches, lighting, bikeracks, and other site amenities.

Resolve aesthetic issues related to trash storage and building utilities. Explore opportunities to relocate trash receptacles to less visible areas or develop landscape solutions that minimize their visual impact.

Resolve site grading and drainage issues to ensure sheet drainage from the buildings or walkways are not compromising water quality in the Ravine.

College Woods Natural Area Gateways

The College Woods Natural Area is one of the University's most valued open space assets. Its legacy can be traced back to the University's origins; it served as Ben Thompson's original woodlot. Throughout the years the Natural Area has been protected and preserved and has afforded students and faculty a unique teaching experience on the University grounds. It has also served as an important recreation resource; a network of trails throughout the Area facilitates walking, hiking, jogging and cross-country skiing. Ironically, given its large scale, symbolic value and ongoing use, the College Woods Nature Area maintains a relatively low profile and many students spend four years at the University without experiencing the Area's beauty and charm.

Part of the reason for this may be the fact that the entrances to

the Natural Area are poorly delineated, failing to announce arrival or passage into this special realm. In one instance passage to College Woods is through a parking lot and in another it is past parked cars and a dumpster. This plan proposes to rectify that by calling for the enhancement of the gateways leading to College Woods Natural Area.

Recommendations:

Strengthen pedestrian connections between the College Woods Natural Area and the main campus. (see recommendations for Library Way)

Acknowledge the gateways to College Woods Natural Area through the development of an appropriate site design. Announce arrival and passage from the built areas of the campus into a more natural setting.

Enrich the landscape at the gateways with new plantings including shade trees, flowering trees, shrubs and groundcovers.

Create opportunities for seating and gathering to facilitate rendezvous and chance encounters.

Address handicap parking and compliance with the draft guidelines established for Outdoor Developed Areas (not yet adopted September, 1999)

Enhance the pedestrian character of this area with the addition of site furnishings such as benches, lighting, bikeracks, and other site amenities.

Explore opportunities to develop interpretative signage at the gateways relating the history of the College Woods or some of the educational on-going experiments.

The Restoration and Enhancement of the Ravine

Over the years, the degradation of College Brook and the proliferation of invasive species such as Norway maple, barberry and honeysuckle have compromised the aesthetic character and beauty of the Ravine as well as its functional capacity to facilitate the movement of stormwater through campus.

In addition to being an important component of the campus' stormwater system, the Ravine is an important component of the campus' open space system. Once considered the back of the campus, the Ravine has evolved into an important crossroads and central space. Yet there is limited opportunity to pause or gather within the Ravine. Instead it has acted as a foil for the development for the surrounding buildings such as the MUB, the Library and the Paul Arts Center.

The restoration of College Brook will do much to enhance the natural character of the Ravine but it is also important to explore ways that enhance the Ravine as a campus open space. Despite its importance as a primary open space many students, faculty and staff fail to understand the Ravine's role. Many view it simply as a "patch of woods" that one passes through on their way to class. It is important that steps be taken to define the Ravine and expand the open space role it serves.

Recommendations:

The edges of the Ravine are ill defined and it is not always clear where one actually enters the Ravine. To strengthen the identity of the Ravine and celebrate passage through it, we propose the construction of a stonewall around its entire perimeter. The wall will be constructed of split-faced granite obtained from local sources.

To celebrate the entrance and procession through the ravine we propose a series of gateways strategically located at primary and secondary entrances. We also propose the refinement of the existing network of trails that wind their way through the Ravine. We propose a hierarchal arrangement of paths that facilitate a direct and efficient passage through the ravine but also a series of secondary path that "loop" through the Ravine connecting a series of seating areas of varied scale to allow for quiet contemplation as well as social gathering.

To facilitate a larger gathering, we propose the creation of a central space strategically located on the primary walkway though the Ravine. Earlier master plans recognized the opportunity to create an amphitheater in the Ravine, we support this concept and propose it be located near the eastern edge of the Ravine in the area adjacent to Horton Hall.

As mentioned in the discussion on the restoration of College Brook it was noted that invasive species such as Norway maple and several shrubs have invaded the Ravine and dramatically altered its natural character. Where feasible we propose the eradication of invasive species and the reintroduction of natural species and cultivars.

College Brook Restoration

Over the years College Brook has been buried, channelized, and realigned. Lax regulatory policies in the 60's and 70's facilitated the degradation of College Brook. Future expansion plans east and west of the Ravine may afford greater opportunity to daylight College Brook and enhance its aesthetic value while upgrading its ability to function as an important element in the storm water management plan.

Recommendations:

Develop a comprehensive Storm Water Management Plan that identifies the entire watershed that feeds College Brook and its minor tributaries. Note impervious surface areas such as parking lots and other non-point sources of pollution within the watershed that increases stormwater runoff or contributes to the degradation of College Brook. Note first-point sources of pollution and stream degradation.

Define opportunities within the watershed but outside the stream corridor to create retention basins, infiltration ponds or created wetlands that can contain stormwater and facilitate its infiltration into the ground before the stormwater reaches College Brook.

Note areas where College Brook has been buried, culverted or channelized. Conduct a thorough Stream Bank Assessment of College Brook to determine areas where stream banks are eroded or compromised in other ways. Note areas where fallen trees or collapsed banks are altering stream flow resulting in compound damage to adjacent stream banks or stream banks further down stream.

Identify general patterns of stream dysfunction and develop appropriate restoration approaches. Identify areas where bank erosion or deterioration requires stabilization. Identify methodologies that stabilize the stream bank but also enhance general aesthetics and wildlife habitat.

Identify opportunities to employ new, sophisticated approaches to stream bank stabilization and general restoration capitalizing on an opportunity to use the restoration of College Brook as an educational opportunity.

Note areas where future development may afford opportunities to daylight buried or channelized portions of College Brook.

Pettee Brook Restoration

Like College Brook, Pettee Brook has been degraded over the years. The creation of the Old Reservoir in the 1920's and the construction of the railroad bed prior to that impacted the dynamics of Pettee Brook and significantly altered the character and vitality of the Pettee Brook downstream. Subsequent development has further impacted Pettee Brook by burying it, culverting it or channelizing it in other ways. It is important that future development enhances rather than detracts from the beauty and functional capacity of Pettee Brook. It is critical that the restoration of Pettee Brook be a primary site consideration in the development of the northwest loop road, especially where the road tunnels under

the railroad. Also the stream must be taken into consideration when improvements are made to the Whittemore Center and adjacent recreational facilities. The restoration of Pettee Brook should follow the same process recommended for the restoration of College Brook.

Recommendations:

Develop a comprehensive Storm Water Management Plan that identifies the entire watershed that feeds Pettee Brook and its minor tributaries. Note impervious surface areas such as parking lots and other non-point sources of pollution within the watershed that increases stormwater runoff or contributes to the degradation of Pettee Brook. Note first-point sources of pollution and stream degradation.

Define opportunities within the watershed but outside the stream corridor to create retention basins or created wetlands that can contain stormwater and facilitate its infiltration into the ground before the stormwater reaches Pettee Brook.

Note areas where Pettee Brook has been buried, culverted or channelized. Conduct a thorough Stream Bank Assessment of Pettee Brook to determine areas where stream banks are eroded or compromised in other ways. Note areas where fallen trees or collapsed banks are altering stream flow resulting in compound damage to adjacent stream banks or stream banks further down stream.

Identify general patterns of stream dysfunction and develop appropriate restoration approaches. Identify areas where bank erosion or deterioration requires stabilization. Identify methodologies that stabilize the stream bank but also enhance general aesthetics and wildlife habitat.

Identify opportunities to employ new, sophisticated approaches to stream bank stabilization and general restoration capitalizing on an opportunity to use the restoration of Pettee Brook as an educational opportunity.

Identify areas where the riparian buffer may be enhanced with new plantings. Identify areas where invasive species pose a significant threat to local flora. Evaluate the feasibility of eradicating the evasive species in an affordable and practical manner.

Note areas where future development may afford opportunities to daylight buried or channelized portions of Pettee Brook.

APPENDIX: PLANT SELECTION

Plant Suitability

Aside from what role the plant is to serve in a design it is critical that plant material proposed in a design be suitable to the micro-climate and unique growing conditions experienced on campus. When specifying plant material for the University campus the following factors should be considered:

Plant Hardiness

Hardiness reflects a plants ability to grow within a specific climatic region. The United States Department of Agriculture (USDA) has established ten (10) hardiness zones for the continental United States. Hardiness zones are based on minimal temperature expected within a region. Hardiness zones should be used for general reference and may vary according to site-specific conditions. For instance, enclosed plazas and courtyards defined by brick buildings and sheltered from northwest winds can often support plant material endemic to warmer zones.

Durham lies within Zone 5 on the USDA Hardiness Map. All plant material specified for use on campus should have a Zone 5 hardiness rating. In some cases, site-specific conditions may warrant the use of Zone 6 plants. Zone 6 plants should be used with restraint on the Durham campus.

Native vs. Exotic

A sustainable approach to planting design advocates the use of native species (those plants indigenous to a particular region) over exotics (non-natives). The use of native plant material is advocated on the assumption that native species are better adapted to local climate and soil conditions. But perhaps the strongest reason for the use of native species is that when used in a design they reinforce a site's unique sense of place.

Defining "native" is somewhat controversial and definitions range from those plants indigenous to the North American continent, to those plants indigenous to a very specific region. The Suggested Native Plant lists contained herein lists only those plants indigenous to southeastern New Hampshire. Other species often

referred to as native (i.e. native to the North American continent) are listed under Suggested North American Plants. Species originating in Europe, Asia and other parts of the world are listed under Suggested Exotic Plants.

Whereas it may be more desirable to use native plants, especially in "naturalistic plantings", the use of exotics in the "built" areas of campus may be acceptable if the chosen plant is critical to the success of the design either spatially, aesthetically or functionally. Designers should strive to limit the use of exotics to no more than 25% of the planting plan. However the use of plants known to be invasive or are carriers of known disease or pathogens is strictly prohibited. (see List of Invasive Plants)

Moisture Requirements

The moisture content of the soil at a given location is a critical consideration in the selection of appropriate plant material. The *Available Moisture Capacity* of a soil refers to the amount of moisture in a soil that is actually available to plants for absorption; it is commonly expressed as inches of water per given depth of soil.

Plants vary in the ability to absorb moisture from the soil. Some plants can absorb adequate amounts of moisture under extremely dry conditions (droughty) whereas some plants require excessive amounts of "free moisture" (wet) for survival. Correlating a plants ability to absorb moisture with a soils available moisture capacity is critical to developing a sustainable landscape plan. Generally speaking soils are classified according to the following moisture capacities:

1. Very High Capacity (wet) more than 12 inches
2. High Capacity (moist) 9 – 12 inches
3. Moderate (average) 6 – 9 inches
4. Low (dry) 3 – 6 inches
5. Very Low (droughty) 0 – 3 inches

Disease Resistance

Each year, disease and insect infestation account for a significant loss of plant material on campus. Plant material that is not lost is often weakened and declines over several years before succumbing. This not only creates an unsanitary condition leading to the further spread of disease but also compromises campus aesthetics.

Disease resistance is an important consideration in the selection of campus plant material. Plants known to be prone to frequent disease or insect infestations shall be avoided.

Salt Tolerance

It is important that campus sidewalks and roadways be kept free of ice. Unfortunately, the use of de-icing materials such as rock salt can have an adverse impact to the health and vitality of campus plants. Most authorities attribute the greatest percentage of salt damage to the aerial disposition of sodium (Na) and chlorine (Cl) ions on the stems, buds, and leaves of plants. [1]

Only trees with the highest degree of salt tolerance should be used in areas exposed to high concentration of salt (streetscape, parking lots, and plazas). Plants showing moderate tolerance should be used in low salt areas (adjacent sidewalks). Sensitive species should be restricted to areas where salts are not applied (Entrepreneurial Campus).

Soil Compaction

Compaction reduces the amount of pore space in soils and limits oxygen availability. Poor soil aeration is probably one of the most restrictive characteristic of urban soils for plant growth.[1]As compaction increases oxygen in the soil is depleted and carbon dioxide increases. This changes the soil atmosphere from an aerobic to anaerobic condition and compromises the plants ability to absorb oxygen and conduct other gaseous exchange. It also inhibits respiration of soil microbes leading to further degradation of the soil environment.

Soil restoration is a complex and costly process. The prevention of soil compaction by monitoring site use and taking proper protective measures during

construction insures the longevity of aerobic soil conditions. Soil preservation before, during and after construction is a practice fundamental to the management of a sustainable landscape.

Root Pattern

Roots perform two important functions; roots anchor the plant in the ground and root tips and hairs filter and draw up vital nutrients, gases and moisture critical to plant survival. The distribution of plant roots varies according to plant species and influences the manner in which a plant should be used in a landscape plan.

1) **Shallow Rooted:** Shallow rooted plants tend to grow large fibrous mats of roots in the top 3' – 4' of the soil. The theory that root systems mirror the canopy of a plant's crown is a myth. In actuality, shallow root systems may spread 1½ - 3 times the reach of the crown. The majority of feeder roots lie within the top 12" – 18" of the soil.

   Plants with shallow root system are prone to drought and compaction injury. Plants with shallow root systems should be used with restraint in lawn areas or areas adjacent to paving where surface roots might heave concrete, asphalt or unit pavers.

2) **Deep Rooted:** Deep rooted plants penetrate deep, in excess of 4' into the soil. These plants have the ability to absorb moisture and nutrients form the subsoil and are therefore less prone to drought injury or compaction damage. In some cases deep-rooted plants have voracious root systems so should be used with restraint near drainage tiles, irrigation lines, and underground utilizes such as sewer and water lines.

3) **Taprooted**: Some plants send down large carrot-like taproots deep into the soil, often in excess of 15'. Plants with deep taproots suffer considerably less damage from construction impacts and periodic drought. However, transplanting Taprooted specimens larger than 3" is often difficult. Taprooted trees should be nursery grown, the transplanting of wild plants should be avoided.

Shade Tolerance

Plants used in a cultured planting tend to do best when grown under conditions similar to the "natural" habitat in which they evolved. Whereas some plants are adaptable to a range of light conditions some plants are quite particular in their ability to respond to varying light levels. When specifying plant material give due consideration to a particular plant's shade or sun tolerance.

Size

A plant's mature size is an important consideration when developing landscape plans. A plant's mature size, the ultimate height or spread they will obtain, should guide its use and siting in the landscape. Avoid situations where plants will outgrow their site location and have to ultimately be removed or require periodic pruning to be kept inbounds.

Invasiveness

Non-native plants should be used with restraint on the UNH campus. Designers should strive to use native species whenever possible, relying on non-native species in situations where native plants may not perform adequately either environmentally or aesthetically.

However, certain species of non-native plants are highly aggressive in growth and often crowd out native species altering local habitats. Plants listed as invasive shall not be specified for use on the UNH campus.

List of Suggested Plants

The following section contains several lists of suggested plants. The plants are listed according to the following categories.

Native Trees & Native Shrubs

These are trees and shrubs indigenous to southern New Hampshire. Designers are strongly encouraged to specify native plant material in the majority of their designs. The tables list only species; cultivars derived from these species expand the planting palette considerably and should be relied upon to bring added diversity and aesthetic appeal to the campus landscape.

North American Trees & Shrubs: These are trees and shrubs native to the North American continent and often listed as native species. These trees are adaptable to the climate of southern New Hampshire and commonly used in regional landscape designs. Once again the tables list only species, there are dozens if not hundreds of cultivars that can be derived from theses tables and would be suitable for use on the UNH campus.

Exotic Trees and Shrubs: These are trees and shrubs whose origin lies either in Europe or Asia. Many of these plants have become staples of landscape design and are commonly used in garden and landscape designs throughout the region. However, while they may grow satisfactory in Durham they should be used with restraint on the UNH campus. The use of exotics should be limited to situations where a native plant can not perform as adequately due to unique site specific conditions or the design attributes (flower, form, leaf texture, habit) of the exotic species are critical to the success of the planting design.

Invasive Species: Plants considered as invasive include those plants that have a tendency to grow rampart and suppress native or indigenous materials. Plants selected for this list have been assembled from various government lists and other valued sources. Plant material listed as highly or moderately invasive shall not be used on the UNH campus.

List of Suggested Native Trees

Native Deciduous Trees		Moisture Requirements					Tolerance			Root
Botanical Name	Common Name	wet	moist	average	dry	droughty	Salt	Compaction	Construction	Pattern
Acer negundo	Boxelder	x	x	x	x	x		□	□	d
Acer nigrum	Black Maple		x	x			■	■		s
Acer pensylvanicum	Striped Maple		x	x			■	■		s
Acer rubrum	Red Maple	x	x	x			■	□		s
Acer saccharinum	Silver Maple	x	x	x	x			□		s
Acer saccharum	Sugar Maple		x	x			■	■	■	s
Acer spicatum	Mountain Maple		x	x			■	■		s
Amelanchier arborea	Downy Serviceberry		x	x			□	■	□	s
Amelanchire canadensis	Shadblow Serviceberry		x	x			□	■	□	s
Amelanchier laevis	Smooth Serviceberry		x	x			■	■	□	s
Betula lenta	Black Birch		x	x	x			■		d
Betula nigra	River Birch	x	x	x	x			■	□	d
Betula papyrifera	White Birch		x	x	x		□	■	□	d
Betula populifolia	Grey Birch		x	x	x		□	□	□	s
Carpinus caroliniana	American Hornbeam		x	x				■		d
Carya cordiformis	Bitternut Hickory	x	x	x	x		■		■	t
Carya glabra	Pignut Hickory			x	x	x	■	■	□	t
Carya ovata	Shagbark Hickory	x	x	x	x	x	■		□	t
Celtis occidentalis	Hackberry	x	x	x	x		□		□	d
Cornus alternifolia	Pagoda Dogwood		x	x						s
Cornus florida	Flowering Dogwood		x	x	x			■	■	d
Craetagus brainerdii	Brainerd's Hawthorn		x	x	x	x	■		□	t
Craetagus chrysocarpa	Golden-fruited Hawthorn		x	x	x	x	■		□	t
Craetagus dilatata	Broad-leaved Hawthorn		x	x	x	x	■		□	t
Craetagus flabellata	Fan-leaved Hawthorn		x	x	x	x	■		□	t
Craetagus mollis	Downy Hawthorn		x	x	x	x	■		□	t
Craetagus pruinosa	Frosted Hawthorn		x	x	x	x	■		□	t
Craetagus punctata	Dotted Hawthorn		x	x	x	x	■		□	t
Fagus grandifolia	American Beech		x	x			■	■	■	s
Fraxinus americana	White Ash		x	x						s
Fraxinus nigra	Black Ash	x	x					□		s

Tolerance:		Root Pattern:	
Sensitive	■	Shallow Lateral	s
Resistent	□	Deep Lateral	d
		Tap root	t

List of Suggested Native Trees

Native Deciduous Trees		Moisture Requirements					Tolerance			Root
Botanical Name	Common Name	wet	moist	average	dry	droughty	Salt	Compaction	Construction	Pattern
Fraxinus pennsylvanica	Green Ash	x	x	x	x	x		□	□	s
Juglans cinera	Butternut		x	x			■			t
Juglans nigra	Black Walnut		x	x	x	x	■		■	t
Larix larcinia	Eastern Larch	x	x	x	x		□	□		s
Nyssa sylvatica	Blackgum	x	x	x	x		□		□	t
Ostrya virginiana	American Hophornbean		x	x	x		■			d
Platanus occidentalis	American Sycamore	x	x	x					□	s
Populus deltoides	Eastern Cottonwood	x	x	x	x	x			□	s
Populus grandidentata	Bigtooth Aspen	x	x				□	□	■	s
Populus tremuloides	Quacking Aspen	x	x					■	□	s
Prunus serotina	Black Cherry		x	x	x		□	■	■	d
Prunus pennsylvanica	Pin Cherry		x	x	x	x	□	■		d
Prunus virginiana	Chokecherry		x	x	x		□	■		s
Quercus alba	White Oak		x	x	x		□	■	□	t
Quercus bicolor	Swamp White Oak	x	x					□	□	s
Quercus borealis	Northern Red Oak		x	x			□	■	□	t
Quercus coccinea	Scarlet Oak			x	x			■		t
Quercus macrocarpa	Bur Oak	x	x	x	x	x	□	■	□	t
Quercus palustris	Pin Oak	x	x	x				□	□	s
Quercus prinus	Chestnut Oak			x	x			■	□	t
Quercus velutina	Black Oak		x	x	x	x		■		d
Rhus glabra	Smooth Sumac			x	x	x	□	■	□	s
Rhus typhina	Staghorn Sumac			x	x	x	□	■	□	s
Salix nigra	Black Willow	x	x					□	□	s
Sassafras albidum	Sassafras		x	x	x	x		□	□	t
Sorbus americana	American Mountain Ash	x	x	x						s
Tilia americana	Basswood		x	x			■	■	■	d
Ulmus americana	American Elm		x	x	x				□	s
Viburnum lentago	Nannyberry		x	x	x		■	■	□	s

Tolerance:		Root Pattern:	
Sensitive	■	Shallow Lateral	s
Resistent	□	Deep Lateral	d
		Tap root	t

List of Suggested Native Trees

Native Evergreen Trees		Moisture Requirements					Tolerance			Root
Botanical Name	Common Name	wet	moist	average	dry	droughty	Salt	Compaction	Construction	Pattern
Abies balsamea	Balsam Fir	x	x				■	□	□	s
Chamaecyparis thyoides	Atlantic White Cedar	x	x							
Juniperus virginiana	Eastern Redcedar		x	x	x	x	□	■	□	t
Picea glauca	White Spruce		x	x			■		□	s
Picea mariana	Black Spruce	x						□	□	s
Pinus banksiana	Jack Pine			x	x	x	□	■	□	d
Pinus resinosa	Red Pine		x	x	x		■	■	□	d
Pinus rigida	Pitch Pine			x	x	x	□	■	□	t
Pinus strobus	Eastern White Pine		x	x			■	■		d
Thuja occidentalis	Arborvitae	x	x	x	x			□	□	s
Tsuga canadensis	Eastern Hemlock	x	x	x			■	■	■	s

Tolerance:		Root Pattern:	
Sensitive	■	Shallow Lateral	s
Resistent	□	Deep Lateral	d
		Tap root	t

List of Suggested Native Shrubs and Vines

Native Shrubs		Moisture Requirements					Tolerance			Plant
Botanical Name	Common Name	wet	moist	average	dry	droughty	Salt	Compaction	Shade	Size
Alnus serrulata	Common Alder	x	x				■	□	■	l
Andromeda polifera	Bogrosemary	x	x				□	□	□	vs
Arctostaphylos uva-ursi	Bearberry			x	x	x	□	■	■	vs
Aronia melanocarpa	Black Chokeberry	x	x	x	x	x	□	□		s
Aronia prunifolia	Purplefruit Chokeberry	x	x	x	x		□	□		m
Ceanothus americanus	Jerseytea Ceanothus			x	x	x	□	■		vs
Cephalanthus occidentalis	Common Buttonbush	x	x				□	□	■	m
Chamaedaphne calyculata	Leatherleaf	x	x					□	■	vs
Clethra alnifolia	Summersweet Clethra	x	x				□	□	□	m
Comptonia peregrina	Sweetfern				x	x	□	■	□	vs
Cornus amomum	Silky Dogwood	x	x	x			■	□	■	m
Cornus canadensis	Bunchberry		x	x	x		■	□	□	vs
Cornus racemosa	Gray Dogwood		x	x	x	x	■		□	m
Cornus rugosa	Roundleaf Dogwood		x	x			■	■	□	m
Cornus stolonifera	Redosier Dogwood	x	x	x			■	□	■	m
Corylus americana	American Filbert		x	x	x		■		□	m
Corylus cornuta	Beaked Filbert		x	x	x		■		□	m
Diervilla lonicera	Dwarf Bushhoneysuckle			x	x	x		□	□	vs
Dirca palustris	Atlantic Leatherwood		x	x			□		□	s
Gaultheria procumbens	Checkerberry Wintergreen			x	x	x	□	□	□	vs
Hamamelis virginiana	Witchhazel		x	x			■	■		d
Ilex verticillata	Common Winterberry	x	x				■	□		m
Juniperus communis	Common Juniper		x	x	x	x		■	■	s
Kalmia angustifolia	Lambkill Kalmia	x	x				□	□	□	vs
Kalmia latifolia	Mountainlaurel Kalmia	x	x	x				□	□	l
Kalmia ploifera	Bog Kalmia	x	x				□	□	□	vs

Tolerance:		Plant Size	
Sensitive	■	Very small (< 3')	vs
Resistent	□	Small (3' - 6')	s
		Medium (6' - 12')	m
		Large (12' - 20')	l

List of Suggested Native Shrubs and Vines

Native Shrubs		Moisture Requirements					Tolerance			Plant
Botanical Name	Common Name	wet	moist	average	dry	droughty	Salt	Compaction	Shade	Size
Ledum groenlandicum	Labradortea Ledum	x	x				□	□	■	vs
Lindera benzoin	Common Spicebush	x	x	x			□		□	m
Lonicera canadensis	American Fly Honeysuckle		x	x			□	□	□	s
Lyonia ligustrina	He-huckleberry	x	x				□	□	■	m
Myrica pennsylvanica	Northern Bayberry	x	x	x	x	x	□	□	■	m
Physocarpus opulifolius	Ninebark	x	x	x	x	x		□	■	m
Potentilla fruticosa	Bush Cinquefoil	x	x	x	x	x	□	□	■	vs
Rubus allegheniensis	Allegany Blackberry			x	x	x			□	s
Rubus occidentalis	Blackcap Raspberry		x	x	x	x			□	s
Rubus odoratus	Fragrant Thimbleberry		x	x					□	s
Rubus strigosus	American Red Raspberry	x	x	x	x	x		□	□	s
Salix humilis	Prairie Willow	x	x	x	x	x	□	□	■	m
Salix lucida	Shining Willow	x	x				□	□	■	l
Sambucus canadensis	American Elderberry	x	x	x	x	x	■	□	□	m
Sambucus pubens	Scarlet Elder		x	x			■		□	m
Spiraea tomentosa	Hardhack Spirea	x	x	x			■	□	■	s
Symphoricarpus albus	Common Snowberry		x	x	x					s
Taxus canadensis	Canada Yew		x				□	■	□	s
Vaccinium angustifolium	Lowbush Blueberry		x	x	x	x	□	■	□	vs
Vaccinium corymbosum	Highbush Blueberry	x	x	x	x		□	□	□	m
Vaccinium macrocarpum	Cranberry	x					■	□	□	vs
Viburnum acerifolium	Mapleleaf Viburnum		x	x	x		■		□	s
Viburnum alnifolium	Hobblebush Viburnum		x	x			■			m
Viburnum cassinodes	Witherod Viburnum	x	x	x	x		□	□	□	m
Viburnum trilobum	American Cranberrybush	x	x	x			■	□	□	m

Tolerance:	
Sensitive	■
Resistent	□

Plant Size	
Very small (< 3')	vs
Small (3' - 6')	s
Medium (6' - 12')	m
Large (12' - 20')	l

List of Suggested Native Shrubs and Vines

Native Vines		Moisture Requirements					Tolerance			Plant
Botanical Name	Common Name	wet	moist	average	dry	droughty	Salt	Compaction	Shade	Size
Celastrus scandens	American Bittersweet			x	x	x	□		□	tv
Clematis virginiana	Virginsbower	x	x	x	x	x	□	□	□	lv
Lonicera sempervirens	Trumpet Honeysuckle		x	x	x	x	□		□	lv
Parthenocissus quinquefolia	Virginia Creeper	x	x	x	x	x		□	□	tv
Smilax rotundifolia	Common Greenbrier	x	x	x	x		□	□	□	mv
Vitis labrusca	Fox Grape	x	x	x	x		□	□	□	tv
Vitis riparia	Riverbank Grape	x	x	x	x	x		□	□	tv

Tolerance:		Vine Size	
Sensitive	■	Low Vine (< 3')	lv
Resistent	□	Medium Vine (10' -25')	mv
		Tall Vine (35')	tv

List of Suggested North American Trees

North American Deciduous Trees		Moisture Requirements					Tolerance			Root
Botanical Name	**Common Name**	**wet**	**moist**	**average**	**dry**	**droughty**	**Salt**	**Compaction**	**Construction**	**Pattern**
Catalpa speciosa	Northern Catalpa	x	x	x	x	x		□	□	t
Cercis canadensis	Eastern Redbud		x	x	x		■			s
Chionanthus virginicus	Fringetree		x	x				■		s
Cladrastus kentukea	Yellowwood	x	x	x				■	■	d
Euonymus atropurpureus	Spindle Tree		x	x						s
Gleditsia triacanthos	Honeylocust	x	x	x	x	x	□	□	□	d
Gymnocladus dioicus	Kentucky Coffeetree	x	x	x			□		□	d
Halesia tetraptera	Carolina Silverbell		x	x			■	■		d
Hamamelis vernalis	Vernal Witchhazel		x	x			■	■		d
Liquidambar styraciflua	American Sweetgum	x	x	x				□		d
Liriodendron tulipifera	Tuliptree		x	x				■		s
Magnolia acuminata	Cucumbertree Magnolia		x	x			■	■		d
Oxydendrum arboreum	Sourwood		x	x				■		d
Ptelea trifoliata	Waferash		x	x	x		□	■		d
Quercus imbricaria	Shingle Oak		x	x	x					t
Rhus copallina	Flameleaf Sumac			x	x	x	□	■		s
Robinia pseudoacacia	Black Locust			x	x	x	□	■	□	s
Viburnun prunifolium	Blackhaw Viburnum			x	x	x	■	■	□	s

North American Evergreen Trees		Moisture Requirements					Tolerance			Root
Botanical Name	**Common Name**	**wet**	**moist**	**average**	**dry**	**droughty**	**Salt**	**Compaction**	**Construction**	**Pattern**
Abies concolor	White Fir		x	x	x			■		s
Picea pungens	Colorado Blue Spruce		x	x	x		□	■	□	d
Pinus ponderosa	Ponderosa Pine			x	x	x		■		t
Pseudotsuga menziesii	Douglas Fir		x	x				■		d
Tsuga caroliniana	Carolina Hemlock	x	x	x			■	■	■	s

Tolerance:		**Root Pattern:**	
Sensitive	■	Shallow Lateral	s
Resistent	□	Deep Lateral	d
		Tap root	t

List of Suggested North American Shrubs

North American Shrubs		Moisture Requirements					Tolerance			Plant
Botanical Name	Common Name	wet	moist	average	dry	droughty	salt	compaction	shade	size
Aesculus parviflora	Bottlebush Buckeye	x	x	x			□		□	m
Aesculus pavia	Red Buckeye		x	x			□			
Aronia arbutifolia	Red Chokeberry	x	x	x	x	x	□	□		m
Calycanthus floridus	Common Sweetshrub	x	x	x					□	m
Fothergila gardeni	Dwarf Fothergilla	x	x	x				□	□	vs
Fothergilla major	Large Fothergilla		x	x					□	m
Hammamelis vernalis	Vernal Witchhazel	x	x	x				□		m
Hydrangea arborescens	Smooth Hydrangea		x	x				□	□	s
Hydrangea quercifolia	Oakleaf Hydrangea		x	x				□	□	s
Hypericum kalmianum	Kalm St. Johnswort	x	x	x	x	x	□	□	■	vs
Hypericum prolificum	Shrubby St. Johnswort	x	x	x	x	x	□	□	■	vs
Ilex glabra	Inkberry	x	x				□	□	□	m
Itea virginica	Virginia Sweetspire	x	x				□	□	□	m
Juniperus horizontalis	Creeping Juniper			x	x	x		■	■	vs
Leucothoe catesbaei	Drooping Leucothoe		x	x						
Magnolia virginiana	Sweetbay Magnolia	x	x				□	□	□	l
Mahonia aquifolium	Oregongrape		x	x			□		□	s
Pachistima canbyi	Canby Pachistima		x	x				■		vs
Pieris florida	Mountain Pieris		x	x				■		s
Rhododendron arborescens	Sweet Azalea	x	x				■	■		l
Rhus aromatica	Fragrant Sumac		x	x						
Viburnum dentatum	Arrowwood Viburnum	x	x	x			□		□	m
Xanthorhiza simplicissima	Yellowroot	x	x	x					□	vs

Tolerance:		Plant Size	
Sensitive	■	Very small (< 3')	v
Resistent	□	Small (3' - 6')	s
		Medium (6' - 12')	m
		Large (12' - 20')	l

List of Suggested North American Vines

North American Vines		Moisture Requirements					Tolerance			Plant
Botanical Name	Common Name	wet	moist	average	dry	droughty	salt	compaction	shade	size
Aristolochia durior	Dutchmanspipe		x	x					□	mv
Campsis radicans	Trumpetcreeper		x	x	x	x		□		tv
Clematis verticillaris	Rock Clematis			x	x			■	□	lv

Tolerance:		Vine Size	
Sensitive	■	Low Vine (< 3')	lv
Resistent	□	Med. Vine (10' -25')	mv
		Tall Vine (35')	tv

List of Suggested Exotic Trees

Exotic Deciduous Trees	
Botanical Name	**Common Name**
Acer buergerianum	Trident Maple
Acer campestre	Hedge Maple
Acer ginnala	Amur Maple
Acer griseum	Paperbark Maple
Acer palmatum	Japanese Maple
Acer tataricum	Tatarian Maple
Carpinus betulus	European Hornbeam
Cercidaphyllum japonicum	Katsuratree
Cornus mas	Corneliancherry Dogwood
Evodia daniellii	Korean Evodia
Fagus sylvatica	European Beech
Ginkgo biloba	Ginkgo
Kalopanax pictus	Castor Aralia
Maackia amurensis	Amur Maackia
Magnolia stellata	Star Magnolia
Magnolia x soulangiana	Saucer Magnolia
Malus spp.	Crabapples (selected cultivars)
Metasequoia glyptostroboides	Dawn Redwood
Phellodendron amurense	Amur Corktree
Prunus serrulata	Japanese Flowering Cherry (selected cultivars)
Prunus subhirtella 'Pendula'	Weeping Higan Cherry
Sophora japonica	Japanes Pagoda Tree
Stewartia pseudocamellia	Japanese Stewartia
Styphnolobium japonicum	Japanese Pagodatree
Tilia cordata	Littleleaf Linden
Tilia tomentosa	Silver Leaf Linden
Ulmus parviflora	Chinese Elm

List of Suggested Exotic Trees

Exotic Evergreen Trees	
Botanical Name	**Common Name**
Picea abies	Norway Spruce
Pinus bungeana	Lacebark Pine
Picea omorika	Serbian Spruce
Pinus cembra	Swiss Stone Pine
Pinus nigra	Austrian Pine
Pinus sylvestris	Scot's Pine
Sciadopitys verticillata	Umbrella Pine

List of Suggested Exotic Shrubs and Vines

Exotic Shrubs	
Botanical Name	**Common Name**
Callicarpa japonica	Japanese Beautyberry
Calluna vulgaris	Scotch Heather
Cotoneaster apiculata	Cranberry Cotoneaster
Cotoneaster dammeri	Bearberry Cotoneaster
Cotoneaster divaricata	Spreading Cotoneaster
Daphne cneorum	Rose Daphne
Daphne x burkwoodii	Burkwood Daphne
Daphne mezereum	February Daphne
Deutzia gracilis	Slender Deutzia
Deutzia x lemoinei	Lemoine Deutzia
Enkianthus campanulatus	Redvein Enkianthus
Exochorda racemosa	Common Pearlbush
Hydrabgea arborescens	Smooth Hydrangea
Hydrangea paniculata	Panicle Hydrangea
Ilex crenata	Japanese Holly
Mahonia aquifolium	Oregon Grapeholly
Pieris japonica	Japanese Pieris
Rhododendron carolinianum	Carolina Rhododendron
Rhododendron catawbiense	Catawba Rhododendron
Sorbaria sorbifolia	Ural Falsespirea
Spiraea albiflora	Japanes White Spirea
Spiraea x bumalda	Bumalda Spirea
Spiraea nipponica 'Snowmound'	Japanese Spirea
Spiraea prunifolia	Bridalwreath Spirea
Spiraea x vanhouttei	Vanhoutte Spiraea
Stephandra incisa	Cutleaf Stephanandra
Syringa vulgaris	Common Lilac
Viburnum carlesii	Koreanspice Viburnum
Viburnum opulus	European Cranberrybush

List of Suggested Exotic Shrubs and Vines

Exotic Vines	
Botanical Name	**Common Name**
Euonymus fortunei var. coloratus	Coloratus Euonymus
Hydrangea anomala petiolaris	Climbing Hydrangea
Pachysandra terminalis	Japanese Spurge
Parthenocisssus tricuspidata	Japanes Creeper
Vinca minor	Periwinkle
Weigela florida	Old Fashioned Weigela
Wisteria floribunda	Japanese Wisteria

LIST OF INVASIVE SPECIES

HIGHLY INVASIVE TREES	
Botanical Name	**Common Name**
Acer platanoides	Norway Maple
Populus alba	White Popular

HIGHLY INVASIVE SHRUBS	
Botanical Name	**Common Name**
Berberis thunbergii	Japanese Barberry
Elaeagnus angustifolia	Russian Olive
Elaeagnus umballata	Autumn Olive
Ligustrum sinense	Chinese Privet
Lonicera maackii	Amur Honeysuckle
Lonicera morrowii	Morrow Honeysuckle
Lonicera tatarica	Tartarian Honeysuckle
Lonicera x bella	Bella Honeysuckle
Rhamnus cathartica	Common Buckthorn
Rhamnus frangula	Smooth Buckthorn
Spiraea japonica	Japanese Barberry

HIGHLY INVASIVE VINES	
Botanical Name	**Common Name**
Ampelopsis brevipedunculata	Porcelain-berry
Celastrus orbiculatus	Oriental Bittersweet
Lonicera japonica	Japanese Honeysuckle

HIGHLY INVASIVE PERENNIALS	
Botanical Name	**Common Name**
Alliaria petiolata	Garlic Mustard
Butomus umbellatus	Flowering Rush
Daucus carota	Queen Anne's Lace
Leucan-themum vulgare	Ox-eye Daisy
Lythrum salicaria	Purple Loosestrife
Verbascum thapsus	Common Mullein

LIST OF INVASIVE SPECIES

MODERATELY INVASIVE TREES	
Botanical Name	**Common Name**
Juniperus virginiana	Eastern. Red Cedar
Populus tremuloides	Quaking Aspen
Robinia pseudo-acacia	Black Locust
Ulmus pumila	Siberian Elm

MODERATELY INVASIVE SHRUBS	
Botanical Name	**Common Name**
Berberis vulgaris	Common Barberry
Cornus racemosa	Gray Dogwood
Cornus sericea	Red Osier Dogwood
Euonymus alatus	Winged Euonymus
Physocarpus opulifolius	Ninebark
Ligustrum vulgare	European Privet
Rhus glabra	Smooth Sumac
Rosa multiflora	Multiflora Rose
Viburnum opulus	European Cranberry-bush

MODERATELY INVASIVE VINES	
Botanical Name	**Common Name**
Euonymus fortuni	Wintercreeper
Vinca minor	Periwinkle

MODERATELY INVASIVE PERENNIALS	
Botanical Name	**Common Name**
Hesperis matronalis	Dame's Rocket
Hydrilla verticillata	Hydrilla
Iris pseudacorus	Yellow Iris
Lysimachia nummularia	Moneywort
Najas minor	Naiad
Nasturtium officinale	Watercress
Nymphoides peltata	Yellow Floating Heart
Valeriana officinalis	Garden Heliotrope