



UNIVERSITY OF MASSACHUSETTS LOWELL

ARBORETUM PLAN

2023



University Of Massachusetts Lowell Arboretum
University Crossing, 220 Pawtucket Street, Lowell, MA. 08154-2874
42.65605°N, -71.32476°W
145.7Acres
<https://www.uml.edu/>

Prepared: April, 2023 by SASAKI

| | |
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| INTRODUCTION | 1-4 |
| Figure 1: <i>UML Arboretum Map</i> | i. |
| Letter from the President | ii. |
| Introduction | 1 |
| Mission | 2 |
| Purpose | 3 |
| Defining Features of the Arboretum | 3 |
| Figure 2: <i>Benefits for the Community</i> | 4 |
| MANAGEMENT PLAN | 5-18 |
| 1. Purpose | 5 |
| 2. Goals and Targets | 6-7 |
| 3. Tree Care Guidelines | 7-13 |
| Figure 3: <i>Campus Collection</i> | 8 |
| 4. Storm Response and Recovery | 13 |
| 5. Tree Protection & Preservation Guidelines | 13-16 |
| 6. Tree Damage Assessment Guidelines | 16-17 |
| 7. Prohibited Practices | 17 |
| DESIGN GUIDELINES | 19-26 |
| 1. General | 19 |
| 2. Operational Function | 19-20 |
| 3. Ecological Function | 20 |
| 4. Horticultural Considerations | 21-23 |
| Figure 4: <i>Collection Opportunities</i> | 22 |
| 5. Visual Considerations | 23-25 |
| COLLECTION POLICIES | 26-38 |
| 1. Purpose | 27 |
| 2. Policy Governance | 27 |
| 3. Arboretum Advisory Committee | 28 |
| 4. Review & Revision of Plan | 29 |
| 5. General Purpose of the Collections | 29 |
| 6. Collection Priorities | 30 |
| 7. Collection Documentation | 30-34 |
| 8. Collection Management Considerations | 34-35 |
| 9. Accessions and Deaccessioning | 35-36 |
| Arboretum Staffing | 37 |
| 2023 Arboretum Advisory Committee | 38 |
| TERMS AND DEFINITIONS | 39-40 |

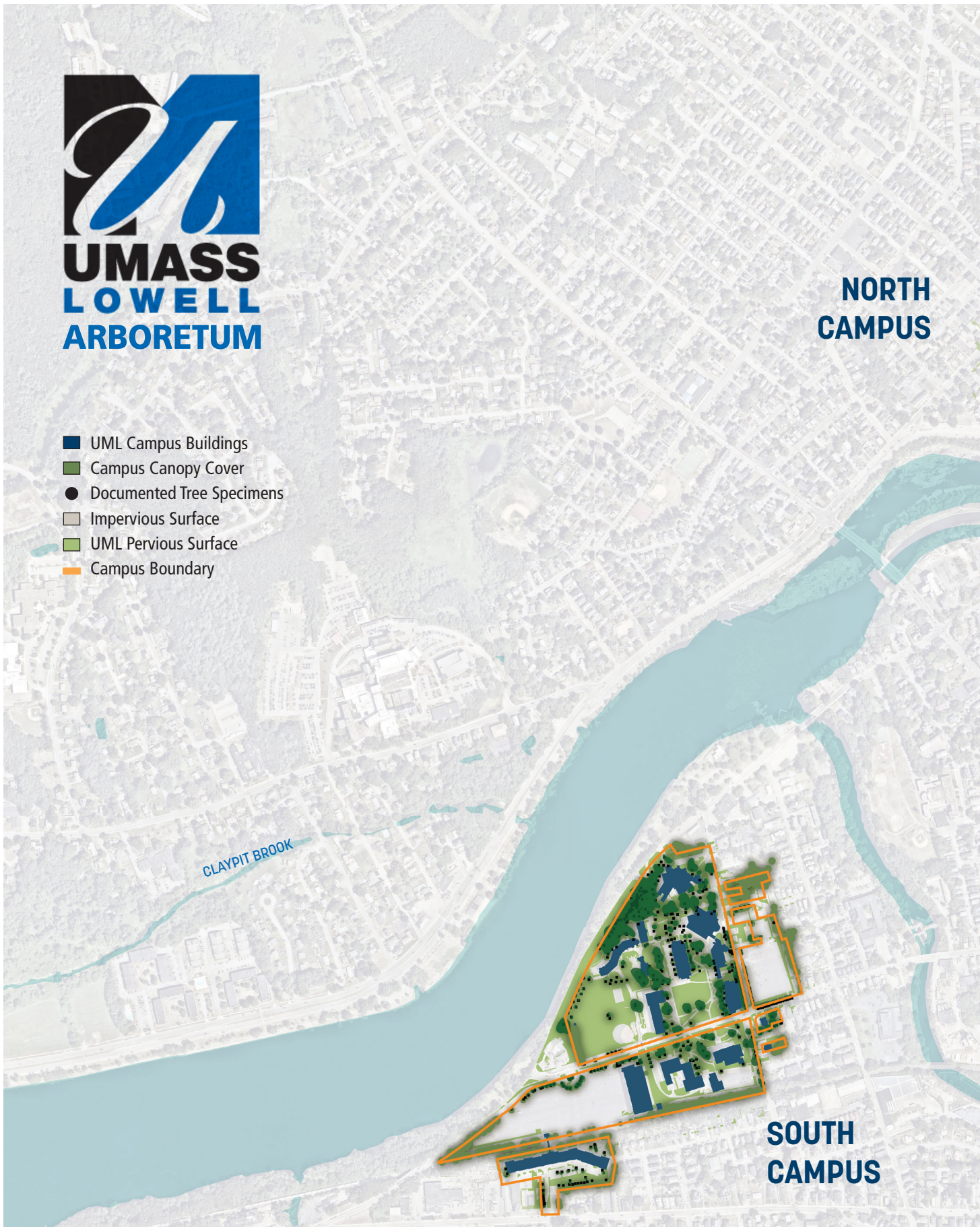


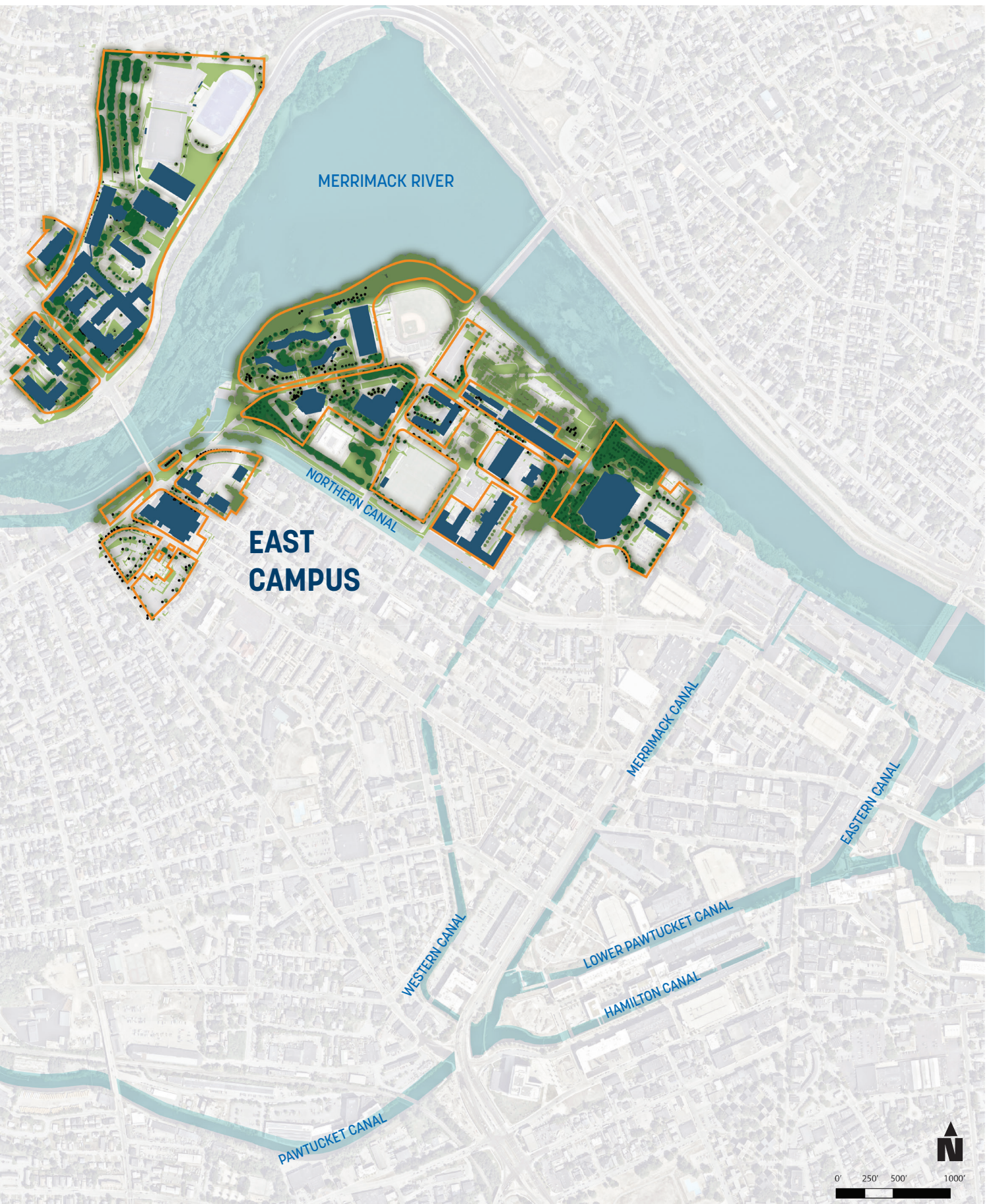
- UML Campus Buildings
- Campus Canopy Cover
- Documented Tree Specimens
- Impervious Surface
- UML Pervious Surface
- Campus Boundary

**NORTH
CAMPUS**

CLAYPIT BROOK

**SOUTH
CAMPUS**









University of
Massachusetts
Lowell

For more than a decade, UMass Lowell has demonstrated its leadership in sustainability. Today, UMass Lowell stands proud as a local, regional, national and international sustainability leader. As a public university, situated in the unique urban setting of Lowell, Massachusetts, our commitment to the physical greening of the campus is a core component of the university's mission.

Through continued investments in the campus landscape, UMass Lowell is proud to be recognized annually by the Arbor Day Foundation's Tree Campus USA program. These investments improve the on-campus experience for our students, faculty, and staff. Crucially, they also serve to benefit our great neighbors in the City of Lowell. Additionally, our partnerships with our community non-profits and city government extend our sustainability and green space improvements across the city.



As UMass Lowell Chancellor, I am proud to launch the formal UMass Lowell Arboretum, which represents the next phase of investments in our campus landscape.

The recent certification as a Level II arboretum by ArbNet, an international coalition of arboreta, acknowledges not just the abundance and diversity of our campus plantings but also the way the UMass Lowell community uses our campus as a living laboratory. The UMass Lowell Arboretum will elevate our student and faculty opportunities for engaged, community-oriented research, mitigate the impacts of climate change, and continue to beautify and enhance our wonderful campus.

I am excited by the possibilities that the new UMass Lowell Arboretum brings to the next decades of investment in our shared campus community.

Sincerely,

A handwritten signature in blue ink, which appears to read 'Julie Chen'.

Chancellor Julie Chen

INTRODUCTION

The University of Massachusetts Lowell Campus Arboretum is an initiative created and implemented through a partnership with the Office of Sustainability and Facilities Management, along with the support of faculty, the student government association and our community partners. Through these organizations efforts, the University of Massachusetts Lowell has achieved recognition through the Arbor Day Foundation as a designated Tree Campus as well as certification as a Level II Arboretum through the ArbNet Arboretum Accreditation program.

The UML Arboretum Plan, which encompasses recommendations for tree maintenance, collection and design, is intended to be a living document to help guide decisions related to the UML campus tree collection and its associated benefits for the community. It will help promote the tree collection as a valuable asset for research, recreation, art, and beautification of the campus.



Tree Campus USA is a program of the Arbor Day Foundation which recognizes best practices in campus community forestry. Founded in 2008, the Tree Campus program promotes the establishment, growth and maintenance of tree collections and urban forests found on the grounds of college and university campuses. The program recognizes institutions of higher education which possess a documented and maintained urban forest, while providing community outreach and service-learning projects about trees on an annual basis. With over 400 college and university campuses enrolled across the United States, the program engages students on the importance of trees within their communities. More information is available at www.arborday.org/programs/tree-campus-higher-education.



ArbNet is an interactive, collaborative, international community of arboreta. ArbNet facilitates the sharing of knowledge, experience and other resources to help arboreta meet their institutional goals and works to raise professional standards through the ArbNet Arboretum Accreditation Program. The accreditation program, sponsored and coordinated by The Morton Arboretum in Lisle, Illinois in cooperation with American Public Gardens Association and Botanic Gardens Conservation International, is the only global initiative to officially recognize arboreta based on a set of professional standards. The program offers four levels of accreditation, recognizing arboreta of various degrees of development, capacity and professionalism. Standards include planning, governance, public access, programming and tree science, planting and conservation. More information is available at www.arbnet.org.

MISSION

The University of Massachusetts Lowell (UML) campus is a unique urban arboretum integral to the fabric of a densely built academic community spread across three campuses in the City of Lowell. It occupies the functional spaces of the campus, including its streets, plazas, quadrangles and pedestrian corridors.

The mission of the UML Arboretum is to develop and maintain a living plant collection that will provide a safe, attractive, educational and sustainable urban forest that faculty, staff, students and visitors can use as a resource for teaching, learning and enjoyment.



Environment for Learning

Through their diversity and organization, the arboretum collections promote education and research opportunities. The collections act as a living laboratory for researching urban plants and their responses to their environment including feedbacks between green spaces, built environment and human health. The arboretum also acts as an outdoor classroom for hands-on, land-based and project-based learning that engages UML students and the broader Lowell community.



Environment for Living

The arboretum is fundamental to the experience of the campus grounds. Trees, shrubs, and herbaceous plants in the UML Arboretum are arranged to enhance the campus with their form, flower and foliage. Campus plantings seek to instill environmental stewardship, connect the campus community to timeless natural processes and foster health and wellness benefits amid the constant activity of urban campus life.



Symbolic Function

The campus landscape is an expression of the institution, its history and connection to the City of Lowell. Recruitment, retention, and lifelong ties of UML to its alumni are powerfully shaped by the campus landscape.



Ecosystem Functions

The campus landscape functions to regulate local climate conditions, improve air quality and mitigate urban heat island effects. Campus plantings also provide erosion and sediment control and assist in the volume and quality management of stormwater runoff. By virtue of the arboretum's proximity to the Merrimack River open space corridor, it extends the habitat value of the local and regional ecosystem. The arboretum landscape supports human health and well-being, providing for social connection, mental restoration and encouragement of pedestrian and bicycle use over automobile use.

PURPOSE

The UML Arboretum Plan identifies policies, procedures and practices used to manage the university's trees and shrubs. The principal components of the Arboretum Plan are the arboretum management plan, the campus landscape design guidelines and the collections policies. The goal of the plan is to guide the development and maintenance of a safe, attractive, educational and sustainable urban campus forest for the University of Massachusetts Lowell.

Specific Objectives of the UML Arboretum Plan are as follows:

- Promote public safety through the use of best practices in the care of campus trees.
- Maintain and increase the educational value of the campus urban forest.
- Enhance the visual quality and aesthetic appeal of the campus through excellence in design.
- Capitalize on ecosystem functions performed by campus trees and shrubs.
- Protect campus trees during construction and renovation projects.
- Acquire high quality plants using industry standards.
- Ensure proper species selection and diversification of the campus tree population.
- Ensure appropriate practices are employed for tree planting and the ongoing care of campus trees.
- Promote proper age distribution in the tree population and reasonable replacement of trees in response to losses from weather, pests, injury or construction displacement.

DEFINING FEATURES OF THE ARBORETUM

Living Collections

As of Fall 2022, the UML Arboretum holds 1,362 surveyed trees of 84 species and cultivars along with an extensive woody shrub collection of 60 primary species among numerous perennials and temporary display annuals. In total, there are approximately 144 woody plant species.

The UML Arboretum collection is recorded on an open platform GIS program (Campus Viewer) with a comprehensive tree inventory. All woody plants are labeled in this GIS program with their common name, scientific name and cultivar, if known. As of this report, the UML Arboretum management team is beginning to add provenance and acquisition information, which is part of the goals in the arboretum management plan. The management plan also notes UML's goal to label each woody plant for its collection documentation purposes.



CAMPUS ARBORETUM

BENEFITS FOR THE COMMUNITY

1,362

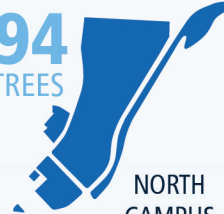
DOCUMENTED TREES
ACROSS 3 CAMPUSES

411
TREES



SOUTH
CAMPUS

394
TREES



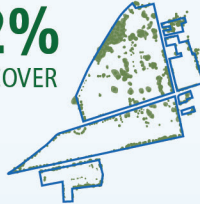
NORTH
CAMPUS

557
TREES

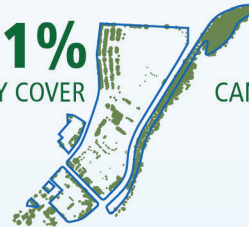


EAST
CAMPUS

22%
CANOPY COVER



31%
CANOPY COVER

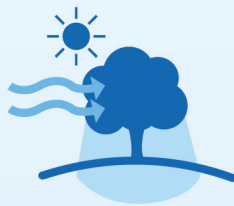
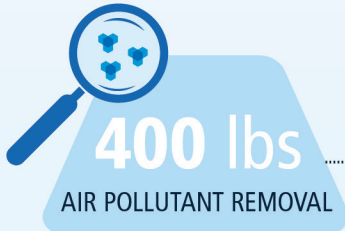


26%
CANOPY COVER



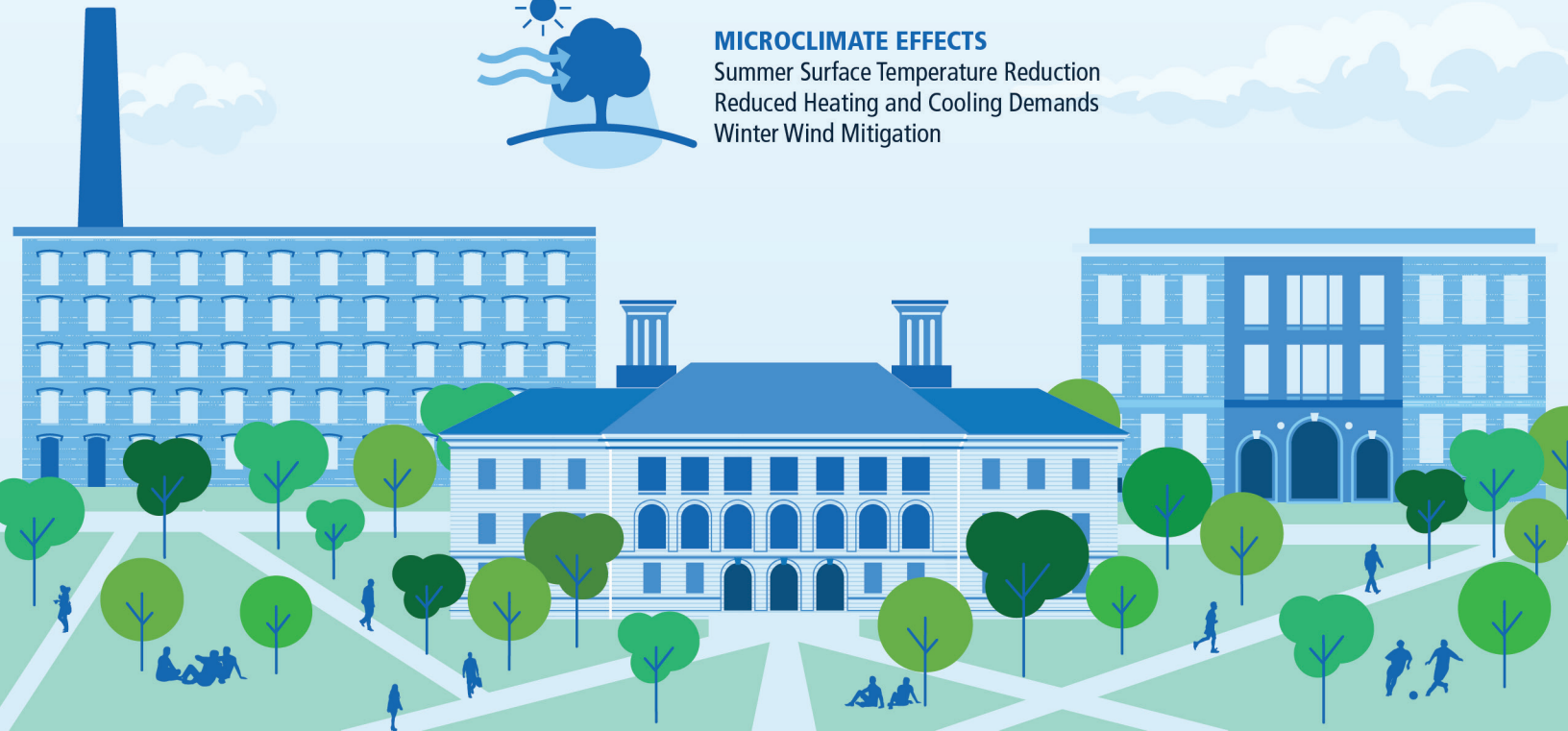
ANNUAL ECOSYSTEM SERVICES

2022 i-TREE ECO SURVEY + ASSESSMENT



MICROCLIMATE EFFECTS

- Summer Surface Temperature Reduction
- Reduced Heating and Cooling Demands
- Winter Wind Mitigation





The background is a solid blue color with various silhouettes of leaves and ferns scattered across it. The leaves include maple-like leaves, oak-like leaves, and some serrated leaves. In the bottom left corner, there are several fern fronds.

MANAGEMENT PLAN

MANAGEMENT PLAN

1. Purpose

The UML Arboretum management plan identifies policies, procedures and practices used to establish, protect and, in some cases, remove the university's tree resources across its three separate campus hubs. The goal of the plan is to guide the development and maintenance of a safe, attractive, educational and sustainable urban campus forest for the University of Massachusetts Lowell. The specific objectives of the plan are:

- Ensure proper species selection, high quality nursery stock acquisition and industry-consensus planting procedures.
- Promote species diversity and proper age structure in the tree population.
- Protect all campus trees during construction and renovation projects.
- Promote tree health and safety by utilizing best management practices when maintaining campus trees.
- Ensure that trees are reasonably replaced when there is mortality due to weather, pest infestations, injury or construction displacement.
- Encourage campus community members to respect and value the campus urban forest.



2. Goals and Targets

As goals and targets are met over time, the list of shall be reviewed and updated by the Arboretum Advisory Committee as needed. The UML Arboretum goals for improvement are as follows.

2.1. Collection Goals

- The arboretum will maintain its existing tree and shrub diversity at 140+ species with plans to increase diversity as new installations allow.
- The arboretum will increase its tree and shrub labeling (accession and/or interpretive) by 300 labels each year for a period of 5 years until the entire collection is labeled. Label replacements will occur during routine tree health inspections or as needed.
- The arboretum will focus its collection of trees and shrubs on species that are native to the Merrimack River Valley to enhance local ecosystem services and wildlife provisioning. In addition to native species, the arboretum will also trial non-invasive tree species that will help create a resilient urban canopy for current and future climate change scenarios, as well as look to increase woody plant diversity and maximize research and public education opportunities.

2.2. Sustainability Goals

- Increase pollinator and songbird food sources.
- Aspire to no net landscape loss and no net canopy loss on campus.
- Decrease impervious areas and pursue green infrastructure additions as part of new plantings and grounds investments. Potential exists for a larger collaboration with City of Lowell for increased impact and benefit.
- Increase ecosystem services on campus and strive to educate the campus community on benefits of trees in urban settings.

2.3. Horticulture Goals

- Continue to work on the tree and shrub maintenance tracking system and record-keeping. Have the system up to date in two years.
- Identify and organize appropriate training courses for grounds staff. Possible topics include tree identification, GIS mapping training, database upkeep training and labeling system training.

- Continue arboriculture and tree maintenance training (pruning training in-house) as well as attending conferences and symposiums for professional advancement in arboriculture and horticulture.

2.4. Plant Display Goals

- Continue to coordinate plant displays of foliage, flower, fruit and form with the university calendar, as well as with campus planning, with the goal of seasonal and visual diversity for the collection.

2.5. Communication Goals

- Launch the UML Arboretum web page as part of the GIS system, and coordinate a launch for Arbor Day 2023. Additional UML Arboretum education and communication resources will also begin in 2023.

3. Tree Care Guidelines

The goal of the UML Arboretum Tree Care Guidelines is to provide a safe, attractive, educational and sustainable urban forest that faculty, staff, students and visitors can use as a resource for teaching, learning and enjoyment.

3.1. Plant Selection and Purchasing Guidelines: Long-term tree success begins with proper tree selection. Trees shall be inspected prior to being selected for use on the campus. The following minimum criteria shall apply:

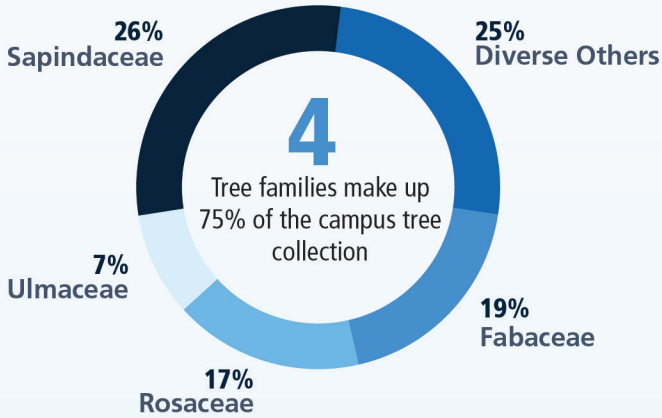
- **General:** Plant material shall conform to the latest edition of the American Standards for Nursery Stock, ANSI Z60.1, by the American Nursery and Landscape Association.
- **Hardiness:** Preference shall be given to plant species that are proven hardy in average annual extreme minimum temperatures of -10 to -5 degrees Fahrenheit (USDA Zone 6a). Occasionally, if microclimate conditions allow, plants with less tolerance to minimum low temperatures may be tested but not used extensively on campus.
- **Site Considerations:** Plants shall be selected and located with due consideration to shade tolerance, salt tolerance, wind exposure, soil drainage conditions, soil compaction and moisture availability. Consideration shall also be given to the canopy space available. Plants selected for campus use shall be of a size that will fit the space available without the need to excessively prune the plant at the time of planting or cause unreasonable pruning demands in the future.



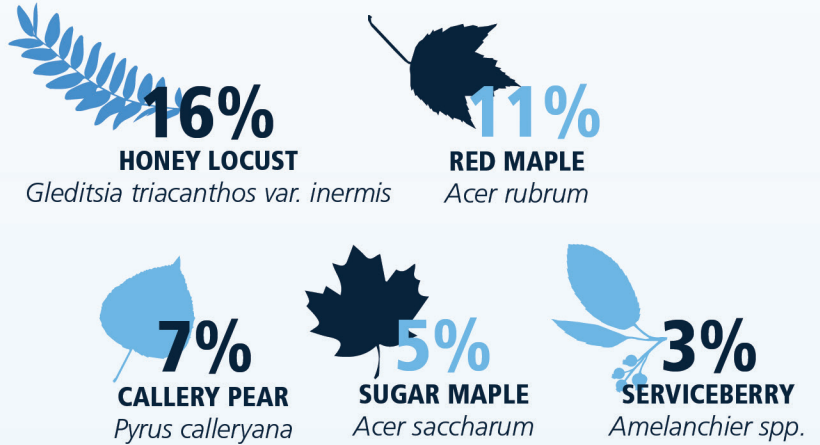
CAMPUS ARBORETUM

CAMPUS COLLECTION

MOST COMMON FAMILIES



MOST COMMON SPECIES



NATIVITY

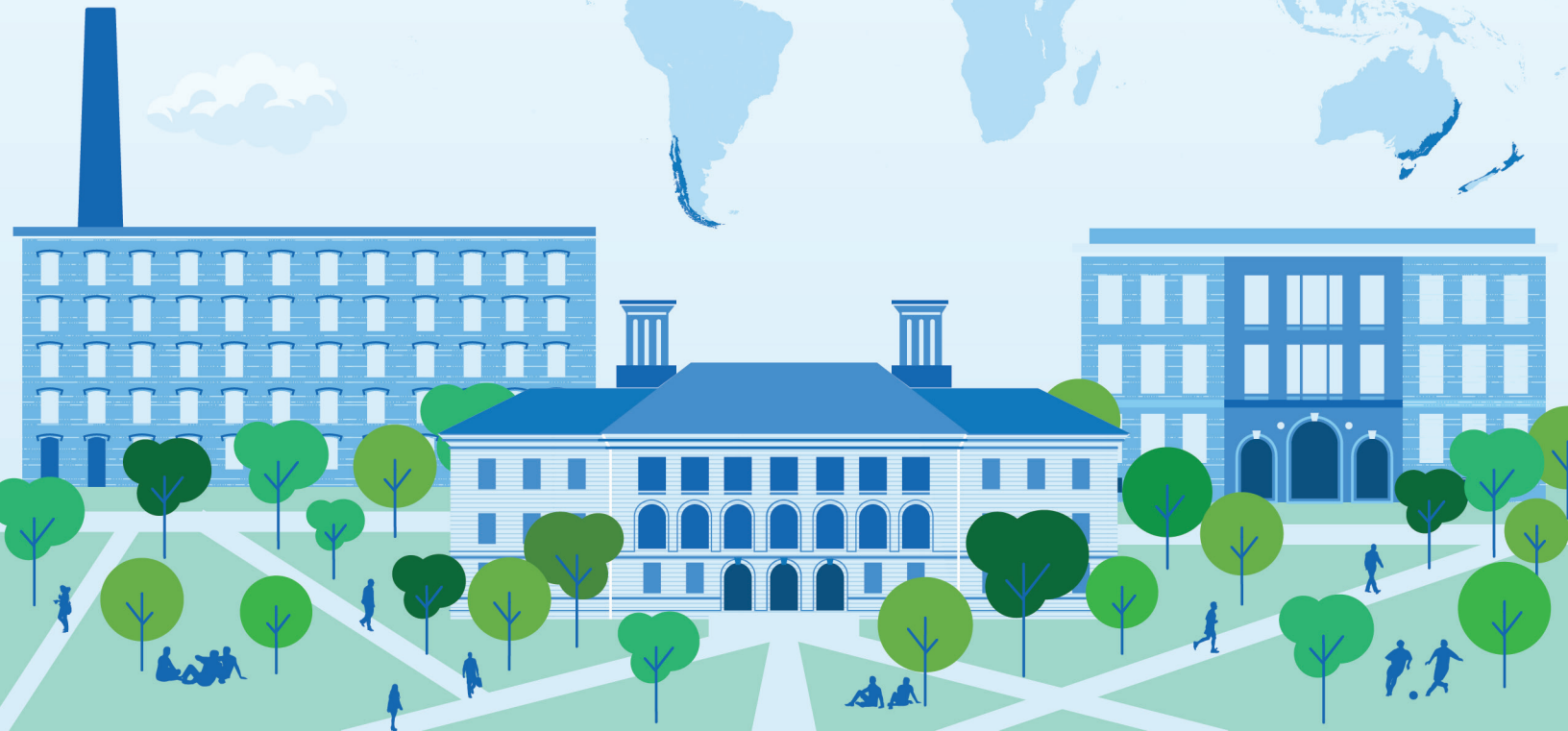
■ Temperate Broadleaf Forests with Similar Species

64% NATIVE TO NORTHEASTERN NORTH AMERICA
898 TREES

16.4% NATIVE TO EASTERN ASIA
224 TREES

13% HYBRID OR CULTIVATED SPECIES
177 TREES

6.6% NATIVE TO EUROPE AND WESTERN ASIA
63 TREES



- **Good Structure of Branching and Root Systems:** Trees shall have good root and branching structures. Roots systems shall be free of kinks, circling roots and girdling roots, and shall not be root bound if in containers. Trunks shall be firmly anchored in the root ball, and root flares shall not be buried. Trees shall have a single leader with a balance branch system where branches are no larger than 2/3 the diameter of the trunk. Multi- leader trees are only acceptable in species for which this is characteristic.
- **Disease and Pest-Free:** All plants selected for use on the campus shall be free of disease and pests. Tree wrapping shall be removed to inspect for pests, disease and damage to the trunk, then replaced. Root balls and containers shall be free of weeds and undesirable or invasive plants.
- **Prohibited Species:** Plants on the Massachusetts Invasive Plant Advisory Group (MIPAG) lists of “invasive” and “likely invasive” plants shall not be used on the campus.
- **Preferred Species:** Preference shall be given to plants that are native to the Northern Hardwood Forest, Appalachian Oak Forest and the Northeastern Oak-Pine Forest plant communities as locally and regionally important to Lowell, Massachusetts.

3.2. *Planting Guidelines:* Planting practices shall conform to the current edition of ANSI A300-06 Planting and Transplanting Standards. The project specifications for each campus project that includes new planting shall apply the standards of ANSI A300-06 to the specific circumstances of the project. The project team responsible for construction documents shall identify and explain all departures from ANSI A300-06. It is recommended that model planting details, available through the International Society for Arboriculture (ISA), be consulted at: <https://www.isa-arbor.com/education/online-resources/cadplanningspecifications>.

Given the limited amount of tree canopy space available adjacent to campus buildings and streets, plants selected for campus use shall be of a size that will fit the space available without the need to excessively prune the plant at the time of planting or cause unreasonable pruning demands in the future.

3.3. *Tree Maintenance Guidelines:* Care of the UML Arboretum trees and shrubs shall be done in accordance with recognized professional standards for woody plant maintenance and management.

- **Pruning:** Campus tree pruning includes the following activities. These activities shall be performed by trained Facilities Management personnel or by outside arborists hired by the university as necessary and appropriate. Arborists shall be certified by the International Society for Arborists (ISA) or as a Massachusetts Certified Arborist (MCA).

- Hazard reduction
- Elevate for ground clearance and sightlines
- Prune for building clearance
- Crown reduction, and crown cleaning
- Corrective structural pruning – reduce secondary leaders, reduce large diameter limbs, reduce upright branches
- Dead wood removal

All pruning practices conform to the current edition of ANSI A300 - 01 Tree Care Standards for Pruning.

3.4. *Pruning Techniques:* To encourage the development of a strong, healthy tree, the following guidelines shall be followed when pruning:

- General Pruning
 - Pruning shall not be conducted without a clear objective or outcome.
 - Prune first for safety, next for health and finally for aesthetics.
 - When removing branches, the pruning cut shall not damage the branch bark ridge and branch collar.
 - Heading cuts should not be used except in storm response and crown restoration procedures.
 - Branch reduction or thinning should be used to achieve pruning objectives rather than making large (>8” diameter) branch removal cuts.
- Cleaning Pruning
 - Cleaning shall be performed to remove dead, diseased, dying, and defective branches, which reduces hazards, promotes health and improves appearance.
 - Large branches should be removed with the aid of ropes and rigging equipment to minimize the risk of tree injury from falling debris.

- Thinning Pruning
 - Thinning shall be performed to reduce the density of branches, which increases light penetration, improves visibility and decreases wind load.
 - Favor branches with strong U-shaped angles of attachment. Remove branches with weak, V-shaped angles of attachment and/or included bark.
 - Promote lateral branch development that is evenly spaced on the main trunk of young trees.
 - Remove any branches that rub or are in contact with another branch or primary trunk.
 - Make sure that lateral branches are no more than one-half to three-quarters of the diameter of the main stem to discourage the development of co-dominant stems.
 - Do not remove more than one-quarter of the living crown of a tree at one time. If it is necessary to remove more, do it over successive years.

- Raising Pruning
 - Raising shall be performed to provide vertical clearance from thoroughfares, signs, streetlights, structures and surveillance cameras.
 - Always maintain live branches on at least two-thirds of a tree's total height. Removing too many lower branches will hinder the development of a strong main stem.
 - Remove basal sprouts and vigorous water sprouts.

- Reduction Pruning
 - Reduction shall be performed to decrease the overall height of a tree or to decrease the length of an individual branch.
 - Use reduction pruning only when absolutely necessary. Make the pruning cut at a lateral branch that is at least one-third the diameter of the stem to be removed.
 - If it is necessary to remove more than half of the foliage from a branch, remove the entire branch.

3.5. *Pruning Schedule:* Shall be dictated by tree species, age, function and placement.

- Trees less than 7 years old should receive structural pruning on an annual basis.
- Trees 7 to 20 years old should receive structural pruning every 3 to 5 years.
- Trees 20 years and older should receive maintenance pruning every 7 to 10 years to clean dead, diseased, dying and defective branches from the crown.

3.6. *Watering, Mulching and Fertilization:* Tree evaluations conducted by trained Facilities Management personnel or by ISA/MCA certified consultant arborists shall be made on a regular basis. The evaluations shall include recommendations for root zone treatments as may be required to promote tree health. Recommendations may include:

- Irrigation
- Root collar excavation
- Aeration
- Surface fertilization
- Application of mulch to retain soil moisture, repress weeds and encourage a healthy root zone.

Soil and root zone practices shall conform to the current edition of ANSI A300 - 02 Tree Care Standards for Soils Management and A300 – 8 Root Zone Management.

3.7. *Disease and Pest Control:* Tree inspections for disease and pests shall be made on a regular basis by trained Facilities Management personnel or ISA/MCA certified consultant arborists. All new plants added to the arboretum shall be free of pests and disease, including weeds and invasive plants growing in the containers or root balls of new plants.

The control of tree disease and pests shall conform to ANSI A300 – 10 Tree Care Standards for Integrated Pest Management.

3.8. *Tree Risk Evaluation, Removal and Replacement Policy:* The Facilities Management Grounds Operations Manager, Grounds Supervisor and grounds staff shall conduct observations through active scouting of campus trees on an ongoing basis to identify problems and tree hazards. Observations shall be increased following storm events. Responses to tree hazards vary from immediate action to scheduled maintenance, depending on the degree of hazard observed.

In addition to active scouting, periodic systematic evaluations of all trees shall be made by an ISA/MCA certified arborist. The latest evaluation and tree condition assessment was done in 2022 by Davey Tree Arborists. In the 2022 evaluation, all trees were given a 360-degree visual inspection. Based on the inspection, recommendations were made, and management response priorities were assigned.

Trees shall be considered for removal if they are: standing dead, a safety hazard, damaged beyond recovery, heavily diseased without the promise of recovery or in the path of a necessary campus construction project.

- Trees considered for removal shall be evaluated by an ISA/MCA certified arborist, who shall make a recommendation to the Grounds Operations Manager. All tree removals require the approval of the Grounds Operations Manager. In some cases when high valued trees need to be removed, the Associate Director of Operations and Services, and the Executive Director of Facilities Operations and Services will become involved in the tree removal decision. In these high valued tree removal decisions, the Associate Vice Chancellor of Facilities Management, the Vice Chancellor of Operations and Services and/or the Chancellor and their staff may be asked to become involved and work on a community engagement and communication plan.
 - Prior to tree removals that could have public repercussions, the Grounds Operations Manager and Associate Director of Operations and Services shall notify the university senior leadership team and University Relations of pending tree removals. University Relations will make tree removal announcements to the university community.
 - Following tree removals, the Grounds Operations Manager shall be responsible for updating the campus tree inventory and mapping.
 - UMass Lowell shall replace any trees cut down on a one-to-one basis, with the replacement tree to be 2 1/2 inches to 3 1/2 inches caliper. If the tree to be removed has a caliper of 24 inches or more, the university shall replace the tree on a one-to-two ratio, with the two replacement trees to be 2 1/2 inches to 3 1/2 inches caliper.

4. **Storm Response and Recovery**

Storm response and recovery are generally accomplished in-house. In a crisis, the priority is to remove tree debris that blocks or disrupts campus thoroughfares.

5. **Tree Protection and Preservation Guidelines**

5.1. *Campus Planning and Development Considerations:* Campus planning and development activities shall be undertaken with the goal to preserve and protect campus trees and shrubs. New projects should be planned to protect existing specimens, expand campus plantings and replace lost trees when possible. Trees in construction areas shall be managed in accordance with ANSI A300 – 05 Management of Trees and Shrubs during site planning, site development and construction. UML also has contractor rules and

regulations that must be followed along with the below recommendations. The UML tree protection and fencing guidelines are as follows:

Tree Protection and Fencing: Tree protection fencing (extending 1.25 feet per inch of trunk diameter or 6 feet, whichever is greater) must be installed around all existing trees to remain on plans within the fenced staging area. Area within tree protection fencing must be mulched with shredded bark or wood chips to a thickness of 4 inches and is off-limits for the remainder of the project. Fencing must be installed before any equipment arrives or work starts. Fence shall be maintained for the duration of the project and not removed without UML permission. Contractor will be required to pay for tree replacement and/or soil compaction remediation costs if there is any incursion into tree protection zones.

This policy as well as the below recommendations will be followed for each construction project.

5.2. Tree Protection During Construction Projects

Prior to or at the beginning of all construction projects, the design team with the assistance of the Grounds Operations Manager shall identify all campus trees that may be impacted by the project. If a campus building, landscape or utility project involves risk to the arboretum collections, the project manager will provide the contractor with the tree protection and fencing guidelines to be instituted before any work is performed, as well as require the preparation of a Tree Protection Plan.

The following tree protection topic areas shall be addressed in the Tree Protection Plan in the project construction documents in addition to UML Tree Protection and Fencing guidelines:

- The Tree Protection Plan will include accurate survey of the trees impacted by the project; identification of trees that will be retained and protected; description of pre-construction activities such as watering, root pruning and crown pruning for protected trees; and designation of a Critical Root Zone (CRZ) and a Tree Protection Zone (TPZ) for protected trees. An ISA and/or MCA certified arborist should be consulted in developing both the critical root zone and the tree protection zone. The Critical Root Zone (CRZ) (sometimes called the Root Protection Zone (RPZ)) is the area that is likely to contain the majority of roots needed to be protected for the tree to thrive.
- For the purposes of this plan, the CRZ shall be defined as a radial offset from trunk of the tree of one foot for every inch DBH (Diameter at Breast Height), or the dripline of the canopy (whichever is larger). The evaluating arborist can make modifications to the CRZ to account for impediments to root growth, such as retaining walls, buildings, utility trenches, etc. Once the CRZ is defined, the Tree Protection Zone shall be defined. For the purposes of this plan, the TPZ shall be defined as the zone where tree protection methods and guidelines must be followed to preserve the health of existing trees. The TPZ must include the full zone of buttressing and rapid tapering of roots (varies based on species and age and shall be determined by an ISA certified arborist) and preserve at least 70% of the CRZ. The CRZ and the TPZ both must be shown on all demolition and tree protection plans included in construction documents for projects that are within 5 feet of a potential CRZ.



- TPZs shall be protected with fencing prior to the commencement of construction and maintained for the duration of the project. Fencing shall be suitably strong and rigidly fixed to last the entire construction period. Provisions for replacement and repair of damaged barriers shall be included. Six foot tall temporary chain-link fencing, wood fencing or expanded metal fencing are all suitable for tree protection fencing. Plastic construction netting on stakes is not acceptable.
- If construction activities need to occur with the TPZ, all exposed soil shall be covered with 2 inches of twice ground mulch prior to work being performed. Mulch to be kept minimum 6 inches off the root flare of the tree. Mulch may be removed at the end of work performed when the barriers are removed.
- Storage of construction materials, waste, equipment, and vehicles in TPZ shall be prohibited. Contractor parking will be prohibited in all tree protection zones.
- Restrictions on waste disposal, equipment cleaning and toxic materials shall prohibit these activities in the TPZ.
- Limitations on excavation, trenching and filling in the TPZ shall include restrictions on methods and types of equipment permitted where grading is necessary. Include proper root pruning guidelines in situations where trenching and excavation will encounter tree roots.
- Guidelines for equipment selection and operation, including equipment with the potential to extend over the protection fence and cause crown damage.

- Root protection and damage mitigation during excavation, including provisions for pneumatic excavation tools, such as air or water spades, in advance of trenching and root pruning.
- If temporary haul or access roads must pass over the root areas of trees to be retained in the construction plan, a roadbed of 6 inches of mulch or gravel must be created to protect the soil. The roadbed material should be replenished as necessary to maintain a 6 inch depth.
- Construction signage indicating the TPZs and prohibitions to entry.
- Upon the review and approval of the project manager, tree protection fencing barriers, signage, temporary mulch and temporary irrigation shall be removed after construction activities that may impact the tree are complete.

6. Tree Damage Assessment Guidelines

Trees damaged during construction projects or by other causes will be evaluated by an ISA and/or MCA certified arborist. The evaluation shall determine whether the tree should be removed, if the tree is to receive treatment for its recovery and the value of the tree if were to be lost.

In situations where damage is attributable to a responsible party, damages will be assessed as follows. Tree damage provisions should be part of all construction contracts involving potential damage to trees.

- 6.1. The dollar value of damage to trees and shrubs will be assessed by an ISA and/or MCA certified arborist and in accordance with The Guide for Plant Appraisal, most recent edition, authored by the Council of Tree and Landscape Appraisers (CTLA) and published by the ISA.
- 6.2. Branch, trunk and root damage which does not have an immediate effect on the tree will cause the university to withhold from contractors responsible for the damage an assessed amount equal to the value of the tree for a period of two years. After that period the impact of the damage to the tree will be assessed by an ISA and/or MCA certified arborist and the value of damage assigned.
- 6.3. A fine of \$1,000 will be levied for each incident involving unauthorized activity within a TPZ in a campus construction area. Unauthorized activities include trespass by personnel, use of equipment, vehicle traffic, parking, materials storage, waste disposal, equipment cleaning and all other activities that may damage the trees in the TPZ. If the incident results in tree damage, an additional damage assessment will be levied equal to the damage incurred.

6.4. For all construction projects it shall be the responsibility of the general contractor to inform all workers and sub-contractors of the project tree protection requirements.

7. **Prohibited Practices**

Under no circumstances will trees or shrubs be removed or planted on the campus without the advance approval of the Grounds Operations Manager.





1962
KITSON HALL

KITSON HALL





**DESIGN
GUIDELINES**

DESIGN GUIDELINES

1. General

While much of the perceived quality of the UML Arboretum landscape depends upon the level and consistency of maintenance applied, the original design also plays an important role; therefore, the following design guidelines shall be followed in the development of all UML Arboretum and landscape projects.

The guidelines are intended to promote consistency and unity throughout the campus landscape. This is often challenging since the campus landscape is designed project by project over time, and often by different teams of designers, contractors and UML project managers.

The UML Arboretum is designed to expand the vision and aesthetics of the South Campus Landscape Master Plan across the campus. The guidelines seek to prevent fragmentation of the landscape into a collection of individual identifiable projects with their own distinct materials and forms.

The overall effect of the UML Arboretum design should be to create a sense of order, scale, refinement and durability that reflects the importance of a public, urban community of higher education.

2. Operational Function

Each landscape design project shall seek to enhance the operational and ecological function of the campus landscape.

2.1. Circulation: Designs shall respond to the specific requirements for existing and planned campus pedestrian, bicycle and vehicular circulation, including emergency and service access. Changes to paths should be coordinated with UML Facilities Management, and where topography and other constraints allow, should closely follow desired patterns of pedestrian movement. Curbs have been used to good effect throughout the campus to protect planting areas from service vehicles, snow removal vehicles and pedestrians. This practice should continue in areas where there is danger of vehicular encroachment into planting areas. Plantings should be designed to allow for proper clearances in all circulation corridors.

2.2. Landscape Use: Designers, project managers, campus planners and the Grounds Operations Manager shall establish programmatic requirements for landscape projects at the outset of the design process. Non-circulation uses such as gathering areas, social spaces, outdoor study spaces, active recreation spaces and outdoor classrooms shall be identified and accommodated.

- 2.3. *Planting Goals:* Particular planting goals for unique campus microclimate zones (deep shade, exposed, sheltered, etc.); for specific educational or collection goals; or specific maintenance requirements shall be identified and specified with the Grounds Operations Manager prior to starting design.
- 2.4. *Utilities:* Utility requirements shall be incorporated into design decisions from the outset of the design process, including consideration of future maintenance access.

3. Ecological Function

- 3.1. *Stormwater:* All landscape projects shall identify best management practices applicable to improving stormwater management for volume and quality. Practices such as proper planting soil design and depths, rain gardens, bio-swales and other applicable techniques including permeable pavements shall be explored and applied as dictated by the project conditions.
- 3.2. *Local Climate Regulation:* There are approximately 145 acres of tree canopy spread across three UML campuses. This canopy is an important mitigating factor in reducing urban heat island effect during the summer months. New landscape projects shall seek to avoid any loss of tree canopy and endeavor to increase the canopy, particularly in areas adjacent to extensive pavement or areas with high cooling demands (e.g., bus stops, residential areas). The canopy works to moderate heat through shade and increased evapotranspiration. Opportunities to employ trees to reduce cooling loads of buildings shall be sought.
- 3.3. *Habitat Enhancement:* Plant assemblages shall be selected to enhance habitats for desirable songbirds, migratory birds and pollinators. Plants that offer food, shelter, resting area and nesting space for desirable wildlife is encouraged. The campus proximity to the Merrimack River and its connected green spaces makes it a well-situated refuge for desirable plant and animal diversity. Enhancing habitat value for desirable species can contribute to conservation of biological and genetic diversity. Habitat spaces may not be suitable for all areas of the campus because of conflicting functional use. Where possible, human access and interpretive information about habitat enhancements and the promotion of biological diversity shall be provided.
- 3.4. *Biological Diversity:* To contribute to the conservation of regional biodiversity, preference should be given to plants that are native to the Northern Hardwood Forest, Appalachian Oak Forest and the Northeastern Oak-Pine Forest plant communities.

4. Horticultural Considerations

4.1. *Appropriateness for Maintenance:* Because of the urban conditions (limited soil volume, poor soil quality, irregular hydrology and limited sunlight) that typify the campus, all plants in the UML Arboretum require continuous care in order to prosper. However, an effort shall be made to avoid conditions that will create extra maintenance. For example, trees with weak wood likely to break up in storms should be avoided. Likewise, plants with excessive fruit production should not be used in paved areas where they may create a safety hazard and clean-up problem.

Plantings shall be located with anticipation of the impacts of routine campus operations such as snow removal, utility maintenance, building maintenance and building move-in and move-out.

4.2. *Horticultural Suitability:* Plants should be selected to match the climatic factors such as wind exposure, deicing salt exposure, sunlight, drainage and soil conditions of the proposed planting location. Plants should be able to adapt to the conditions in which they are planted. Preference should be given to plants that are proven performers in growth and vitality; are adaptable to a range of conditions; have limited pest and disease problems; and are not invasive as identified in the Massachusetts Invasive Plants Advisory Group (MIPAG) list of invasive and likely invasive plants.

Plants with desirable characteristics and arboretum collection priority, but with suspected inadaptability to the campus growing conditions, shall be used in limited quantities and only as approved by the Grounds Operations Manager.

4.3. *Planting Size:* Many of the available planting locations on the three campus hubs of UML are either part of larger open recreational spaces or constrained by buildings and streets. To ensure that plant materials are sized to fit the spaces they are assigned, care shall be taken to accurately measure canopy space prior to plant selection. Plants shall be selected to fit the space available without having to resort to hard pruning. Care shall be taken to ensure plantings do not obscure sightlines and contribute to a safe and enjoyable campus experience.

In general, smaller tree sizes (2 to 3 inch caliper) are preferred to large specimens, as long as the trees can be adequately protected from pedestrians, bicycles and vehicles until the plant reaches a sufficient size to reduce accidental damage. The advantages of planting smaller trees include lower initial material and labor costs, as well as better acclimation of the plant to its new site.

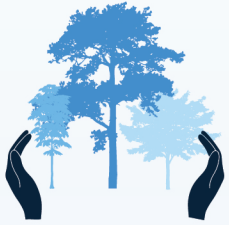
Consideration shall also be given to the growth rate and ultimate size of plants to avoid plants outgrowing their sites and causing long-term maintenance problems. When selecting plants for constrained sites, designers shall consider cultivars that have dwarf or fastigate forms.



CAMPUS ARBORETUM

COLLECTION OPPORTUNITIES

COLLECTION GOALS



MAINTAIN **140+**
SPECIES AND CULTIVARS



EXPAND
ARBORETUM
DIVERSITY



PRIORITIZE
RESEARCH
INITIATIVES



These native tree genera support vast numbers of insects, which are the building blocks of local food webs



CALLERY PEAR
• *Pyrus calleryana*



NORWAY MAPLE
• *Acer platanoides*



Celtis



Carya



Salix



Sassafras



Liriodendron



Oak



Tilia



Nyssa



Ilex

BLACK LOCUST
• *Robinia pseudoacacia*



HONEY LOCUST
Gleditsia triacanthos

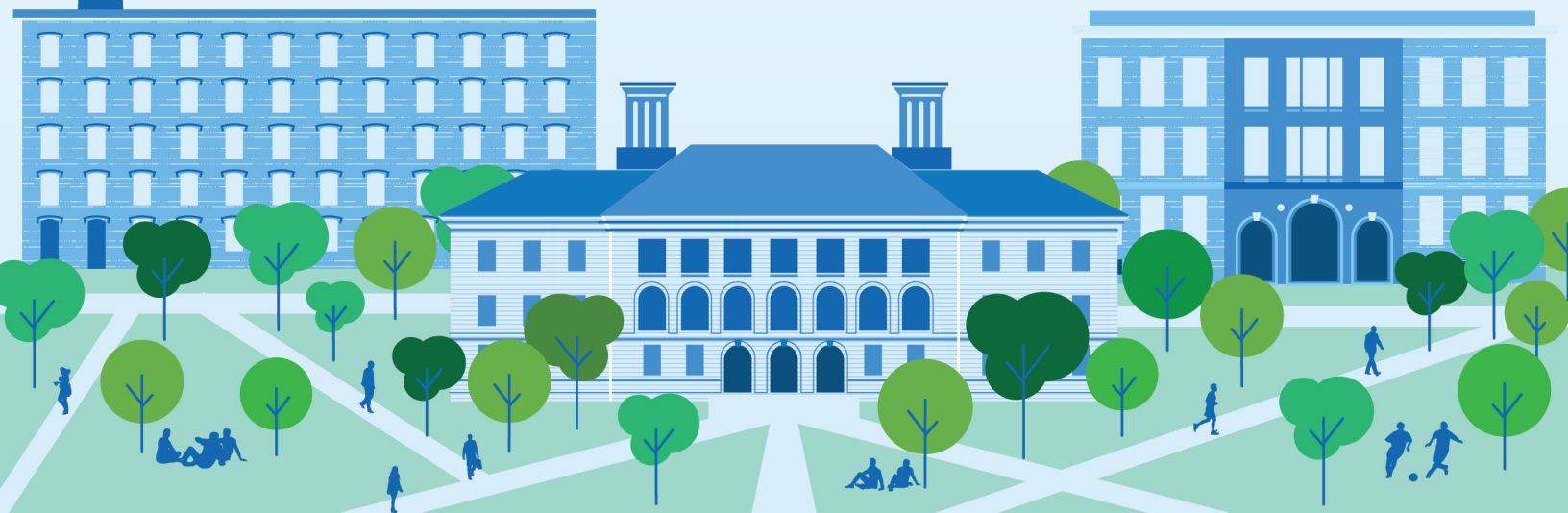
• Documented Northeast Invasive Tree



LABEL & CREATE EDUCATIONAL INTERPRETATION BY 2025



HOST YEARLY OUTREACH EVENTS



- 4.4. *Layering*: In an effort to optimize the effectiveness of the planting space available on the campus, designers shall strongly consider the potential for layered planting where conditions allow. Layered planting means that a single planting area can possess a combination of canopy trees, understory trees, shrubs and herbaceous or woody ground cover plantings. This approach may result in plant assemblages that mimic natural woodland communities and can result in lower long-term maintenance.
- 4.5. *Species Representation*: The 10-20-30 urban forestry guideline shall be applied to tree selection. The guideline is intended to reduce the risk of catastrophic tree loss due to pests or disease. The campus tree population should include no more than 10% of one species, 20% of any one genus, or 30% of any botanical family. The 2022 tree inventory documents the current urban forest composition.

5. Visual Considerations

- 5.1. *Purposeful Space Definition*: The use of three-dimensional buildings, walls or plant materials to frame and enclose space is referred to as “space definition.” Streets, paths, low hedges, curbs and other boundaries also influence space definition, but less profoundly than three-dimensional buildings, walls and plantings.

The organization of the primary landscape corridors, plazas and lawns is a foundational aspect of the campus landscape design. It should be one of the first considerations for all landscape and planting projects and should precede the selection of all plant species. Determining the space-defining role (edge definition, overhead canopy definition, background visual barrier, focal point of visual attention, etc.) of a given planting will play a significant role in plant selection. All planting proposals for the campus should commence with the definition of space-defining goals.

- 5.2. *Scale*: The strongest elements of space definition on the campus are its buildings. Their mass, size and close-packed arrangement define the spatial framework of the campus experience. For planting designs to be successful in the context of campus buildings, they must be of the appropriate institutional scale. That is, plantings shall adopt proportions compatible with the size and composition of adjacent buildings. Small planting gestures in close association with large institutional buildings can look trivial and will fail to contribute to the order of the campus. Major streets, pedestrian corridors, plazas and open spaces should be designed with simple bold plantings that reflect the scale of their surrounding buildings. The most useful plantings to positively achieve human scale in the landscape are shade trees. Tree canopies over pedestrian spaces lower the “ceiling” of the landscape and pleasantly reduce the apparent size and mass of adjacent buildings. The same trees provide attractive naturalistic scenery for occupants inside the building.

Intricate garden-scale plantings that add to the intimacy of the landscape experience should be reserved for smaller courtyards and corridors.

- 5.3. *Unity and Variety*: In general, the diversity of campus plantings is encouraged for ecological reasons; however, diversity should not result in the loss of visual unity and coherence in the major pedestrian linkage spaces of the campus.

Whereas architectural distinctiveness and variety are attributes often considered desirable and recognized as inherent among the various building program requirements and building types that make up a campus, the design attributes most sought in the campus landscape are unity and continuity of effect.

Design variety in the UML Arboretum landscape for its own sake or as a matter of personal style or preference is discouraged in favor of an approach that connects the various parts of the landscape into a unified whole. The campus landscape design should evoke a psychological calm that derives from its consistent treatment. The design goal is a landscape defined by rhythmic, continuous spatial sequences and the harmonious use of materials instead of individual expressions that sacrifice connection to the whole. It is far more important to have the adjacent parts of the landscape form a connected, well-planned experience than it is to have a landscape designed to suit the unique materials and forms of a particular building or designer at the expense of the larger landscape experience.

Designers should look at the best parts of the existing campus landscape and its plantings as a source of inspiration with the intent of perpetuating the better qualities of the historic landscape and adding new plantings in a seamless way. In the long term, campus community members should be struck by the continuity of the overall campus landscape composition rather than by the differences bestowed by different generations of designers. There will always be enough variety in the campus environment because of its diverse building design and the irregular patterns of space between buildings. It is not necessary or desirable for the landscape design to do anything other than seek the profound repose that derives from well composed unity and consistency.

- 5.4. *Informal Character*: The organization of many campus plantings is informal, free of repetitive geometric patterns. Except in streetscapes and the few formal quadrangles, the dominant order of the campus plantings should continue to be informal. The advantages of informal, naturalistic arrangements are that they are flexible and reasonable to maintain, and perfection is achievable in many ways. Compared to regular geometric arrangements, informal plantings are more resilient to change over time. As plants are lost to damage or disease, they can be readily replaced without losing the overall effect of the design.

- 5.5. *Biomorphic Form*: One of the principal aesthetic motives for planting design on the campus shall be to provide a biomorphic contrast to the man-made, geometric built forms that dominate the campus environment. The introduction of the biomorphic forms of trees and shrubs should be an intentional means of achieving visual interest and providing contrasting naturalistic scenery. Careful designs that juxtapose the elegant forms of branching, foliage, fruit and flower against a background of buildings and pavements will amplify the effect of plants. To achieve this effect the plantings must be sufficiently bold, carefully composed and proportional to the geometric context. They also must be well maintained to convey health and vitality.
- 5.6. *Seasonal Effect*: The selection of plants shall consider the benefits that a particular species will bring with respect to visual interest throughout the seasons. Attention shall be directed to achieving winter interest by selecting plants with evergreen foliage, ornamental bark, persistent fruit and/or attractive branching habit. Coordination of seasonal effects with the university calendar shall seek to optimize the benefits of flower, foliage, form and fragrance.





REGISTER

WELCOME TO THE UNIVERSITY

WELCOME TO THE UNIVERSITY

The background of the entire page is a light blue color, overlaid with a pattern of darker blue silhouettes of various leaves. The leaves include simple oval shapes, maple-like shapes with three lobes, oak-like shapes with five lobes, and fern fronds with many small leaflets. The silhouettes are scattered across the page, creating a textured, autumnal feel.

COLLECTION POLICIES

COLLECTION POLICIES

1. Purpose

The UML Arboretum collections policy provides uniform direction to assist in the maintenance, expansion and development of the UML campus tree and landscape collections. This document identifies collection priorities within the framework of the institution's mission, vision and available resources. The collections plan shall:

- 1.1 Provide a definition of the campus landscape as a designated arboretum.
- 1.2 Guide future development of the arboretum to increase value to the UML community and the City of Lowell.
- 1.3 Guide and create transparency on the curation decision process of accessioned and deaccessioned plants, while enumerating priorities for collections to better manage living specimens.
- 1.4 Give vision for an ideal collection to balance the mission of the university, the desire of campus Facilities Management staff, the needs of stakeholders (including students, faculty, staff, alumni and the general public) and future campus landscape needs.
- 1.5 Serve as a training tool for Facilities Management staff and a repository for institutional knowledge as part of a greater succession plan as leadership staff changes.

2. Policy Governance

The Grounds Operations Manager has responsibility for implementing and updating the collections policy with guidance from the Arboretum Advisory Committee. All grounds staff play a role in curation by responding to stakeholder feedback, proposing acquisitions that increase the value of the collection, identifying opportunities to replace accessions, and nominating plant materials for deaccessioning. Decisions about accessioning and deaccessioning are the primary responsibility of the Grounds Operations Manager. The Grounds Operations Manager will also consult with the Arboretum Advisory Committee and UML staff, faculty and students to address needs to ensure that the collections are of maximum academic benefit to the UML community.



3. Arboretum Advisory Committee

The Arboretum Advisory Committee will provide guidance of the living collections to maximize academic opportunities, research possibilities and public education as they evolve over time. The Arboretum Advisory Committee, comprised of representatives of the campus community, serves in an advisory role to ensure collection changes are aligned with policy, management issues and available resources.

3.1 Membership: The committee is comprised of representatives from the Student Government Association (SGA), faculty that engage with the collection and staff from Facilities Management, Sustainability and Advancement offices. Each group may from time to time update the individuals that sit on the committee, although members serve without expiration.

3.2 Committee Charge: The committee develops and supports initiatives that promote the arboretum. Areas of interest include the following:

3.2.1 Formulation and review of arboretum goals, plans and policies.

3.2.2 Review and amendment of campus arboretum management and implementation activities.

3.3 Meetings: The committee will meet at least twice annually to address its charge.



4. **Review and Revision of Plan**

The collections policy shall be referred to as a living document and is to be reviewed and updated as the Arboretum Advisory Committee and Grounds Operations Manager deem suitable to fit the needs of the university and collection goals. A comprehensive assessment of this policy shall occur no less than every five years with guidance from the Arboretum Advisory Committee. Stakeholder input and review will be sought during any substantial revisions of the collections policy.

5. **General Purpose of the Collections**

The UML Arboretum collections serve as landscape and material resources for educational and research activities, recreation and enjoyment by the university community and visiting public. Important secondary purposes of the collection serve as examples of native and adapted plant diversity within New England, providing ecosystem services beyond the campus landscape and for the City of Lowell.

6. Collections Priorities

The collections maintained at the UML Arboretum fall within two broad categories: general and specialized collections:

6.1 General collection, or non-specialized collections that are managed for support of the university's landscape with special focus on environmental and aesthetic values befitting the urban-influenced climate and conditions of Lowell, Massachusetts. This primarily public display contains plants whose role is primarily aesthetic and to illustrate landscape design concepts (e.g. right plant, right place, formal or naturalistic garden elements, four season interest, pollinator habitat, water conservation and native plant landscapes). When practical, the general collection is used to trial new species, cultivars and hybrids in order to inform the university community and general public of new landscape plants that are performing well in our current climate and show promise of performing well in future climate scenarios for Lowell.

6.2 Specialized collections are those collections slated for continued and robust growth in both taxonomic diversity and conservation value, and that add value to student education and observation. They include the following:

6.2.1 *Curriculum Collection:* This teaching collection focuses on plant specimens already present or future accession priorities to aid class work in plant identification, systematics, and taxonomy. This important tangible learning resource provides critical hands-on learning outside of the classroom and creates opportunities for collaboration between university planners, grounds staff, faculty, and students.

6.2.2 *Northeastern U.S. Collection:* Approximately 40% of the surveyed trees in the UML Arboretum are native to the Northeastern United States including Massachusetts, Maine, New Hampshire, New York, Connecticut and Rhode Island.

7. Collection Documentation

The value of an accession to the collection is augmented by the extensiveness of its documentation within the plant database. Plants with more complete documentation (provenance data, collection information, biological performance data, cultural significance and history of use by students, faculty and staff) are more valuable than those with less documentation. When practical, plants with less extensive documentation should be replaced by those with more thorough or significant documentation.

7.1 *Digital Inventories:* Digital plant records are to be updated by the Grounds Operations Manager (and arboretum support staff) as specimens are accessioned or deaccessioned to the permanent collection on an annual basis. Grounds staff are encouraged to document plant health and condition and report to the Grounds Operations Manager as they are encountered. An annual review of the collections inventory should be attempted at five-year intervals.

7.2 Arboretum Database Inventory Fields

| Category | Field Entry |
|--------------------------------|---|
| Accession Number | Alphanumeric |
| Genus | Accepted Genera |
| Species | Accepted Species |
| Cultivar / Selection | Known Cultivar / Selection |
| Provenance | Place of Acquisition |
| Acquisition Date | Numeric Date: Year/Month/Day |
| GPS Coordinates | Numeric: Latitude, Longitude |
| Latest Review Date | Numeric Date: Year/Month/Day |
| Condition | Missing, Removed, Dead, Poor, Fair, Good, Excellent |
| DBH | Numeric: Inches |
| Maintenance Priority Category | NA, Low, Medium, High, Critical |
| Maintenance Action Notes | Text Field |
| Tribute – Memorial Affiliation | Yes / No |
| Tribute – Memorial Donor | Text: Official Donor Name |
| Tribute – Memorial Date | Numeric Date: Year/Month/Day |
| Tribute – Memorial Comments | Text Field |

7.3 Landscape Archive Photography: The campus landscape plays an important role in the identity of UML and in alumni memories and perceptions of their alma mater. As UML continues to develop and as its landscapes evolve, photo documentation is a critical component to archive.

In scenarios of construction which may alter large sections of the collection, photo documentation of the affected area and specimens is to be created and plant records archived for historical reference. After construction, new photos and plant records are to be created and added to the plant records database.

7.4 Labeling Standards

7.4.1 Accession Labels: All collection specimens will have an accession label, which is referred to, monitored and maintained by grounds staff and the Grounds Operations Manager. Under no circumstances will the accession label be removed from the plant. In cases of large numbers of individuals linked to one accession number (clonal plants) and maintained in one location, only one permanent label is required, and the circumstance noted in digital records.

Accession labels will ensure plant specimens are accurately inventoried and referenced. Plants that are deaccessioned may not have their accession label information or label transferred to another specimen.

Accession labels will include:

Accession Number

Scientific Name

Common Name

Accession Date

Source / Collection Data or Provenance

Location Information

7.4.2 Display Labels: Plants of significant merit including historic or educational value and those on publicized arboretum interpretation shall have labels that denote botanic taxonomy (genus, species, cultivar, variety, etc.) and relevant information which may include area of nativity, names in other languages or cultural identifiers. Public display labels are to be oriented for easy view and appropriate size, scale and attachment method depending on the specific plant.



7.5 Inventory Documentation Goals

Baseline Survey Inventory – Completed Summer 2022

Organization of Baseline Inventory and Data Field Creation – Fall 2022

Identification of General and Specific Collections, Including Interpretation Outline – Fall 2022 to Spring 2023

Accession Label Prioritization

- New Acquisitions Post-Spring 2023: Shall be labeled with accession labels for collection purposes at time of installation, with a time period not exceeding 60 days after installation
- Existing Collection Acquisitions: Shall be labeled with accession labels in five increments, each representing 20% or roughly 300 individuals (of the entire collection) over a period of five years: Spring 2023, Spring 2024, Spring 2025, Spring 2026 and Spring 2027.
- Public Interpretation Labels: Installation shall be the decision of the Grounds Operations Manager with priorities extending to labeling curriculum-based collections.
- Online Collections Portal: Implementation and creation of a publicly accessible interface to visualize the UML Arboretum collections will be completed by the UML FIS team for the Spring 2023 UML Arboretum Launch.

8. Collection Management Considerations

8.1 *Climate Change and Ecology:* The UML Arboretum has an obligation to proactively address climate change through planning and action. Plant accessions will be evaluated for their water needs, disease and pest resistance, drought tolerance, hardiness and resilience to extreme temperatures in the current and near future climates. The specifics of soils, drainage and hydrology, habitat, landform and orientation, and ecological function should guide selection and placement of accessions in the landscape. Accessions will, when possible, be replaced with taxa of comparable collection value if the replacements help mitigate climate impact, enhance campus adaptation to climate change or increase ecosystem functions.

8.2 *Legal and Ethical Acquisition of Plants:* The UML Arboretum follows all state and federal laws governing the collection, dissemination and propagation of plants including the Endangered Species Act (1973) and the Lacey Act (1900, amended 2008). The arboretum also adheres to the Convention on Biological Diversity (1993) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975).

The UML Arboretum will not knowingly purchase, acquire, or curate plants, propagules or other plant materials that have been or are suspected of having been illegally collected or imported, except for confiscated plants legally procured from the United States Department of Agriculture. The arboretum will perform due diligence to ensure that purchases and acquisitions are not contributing to habitat destruction or over-collection of plants from the wild. Material transfer agreements, collection permits and other acquisition agreements that regulate plant ownership, propagation or distribution will be archived for the life of the accession and properly noted in collection records.

8.3 *Controlled Substances:* The UML Arboretum complies with all local, state and federal laws regarding prohibited compounds and controlled substances. The arboretum shall not acquire or possess plants, plant materials, plant products or plant compounds that are regulated by such laws without proper state and federal permits. If the arboretum is in possession of a plant that is found to violate local, state or federal laws, the plant will be safely destroyed under the supervision of at least two UML Arboretum employees, one of whom will be the Grounds Operations Manager.

8.4 *Invasive Species:* With proximity to important ecological connectors like the Merrimack River and multiple smaller green spaces of Lowell, Massachusetts, the UML Arboretum actively seeks to limit the introduction and spread of invasive species. The United States Department of Agriculture, Invasive Plant Atlas of New England and Massachusetts Department of Agricultural Resources lists of invasive species will be used to review the plant collections and potential accessions. Plants that are known to pose a risk of escape in Massachusetts will not be accessioned unless there is evidence that the accession can be monitored and reasonably safeguarded from escape. Plants on the Massachusetts Invasive Plant Advisory Group (MIPAG) lists of “invasive” and “likely invasive” plants shall not be used on the campus. Accessions that are not on these invasive species lists may still be removed from the collection if there are concerns about their potential invasiveness.

9. Accessions & Deaccessioning

9.1 Accessions: Plants selected for retention in the UML Arboretum for greater than 12 months and that serve one or more of the collection priorities may be nominated for inclusion. Plants included for temporary aesthetic value (e.g. seasonal displays) will not be accessioned.

Criteria for Accessions:

- The taxon is particularly well suited culturally for the UML Arboretum grounds, context and climate.
- The taxon adds to the arboretum's species diversity and aligns or fills gaps in special collections.
- The taxon is of merit for landscape use within the City of Lowell.

9.2 Initial Procedure for Accessioning: Information for all incoming plants designated for permanent collections must be recorded in the plant database and be accompanied by bills of sale, shipping documents or documents which disclose the plants provenance, date of acquisition, purchase size, and vendor, collector or donor. An accession label with a unique identifier shall be distributed to installed specimens within three months of installation.

9.3 Removal or Deaccession of Specimens: To improve the quality of the living collections or to permit essential university-related construction, it is sometimes necessary to remove accessions from the collection. In normal conditions, removal occurs when the plant is in decline, has been damaged, concerns about invasive potential arise or general loss of functionality for display or educational purposes has occurred.

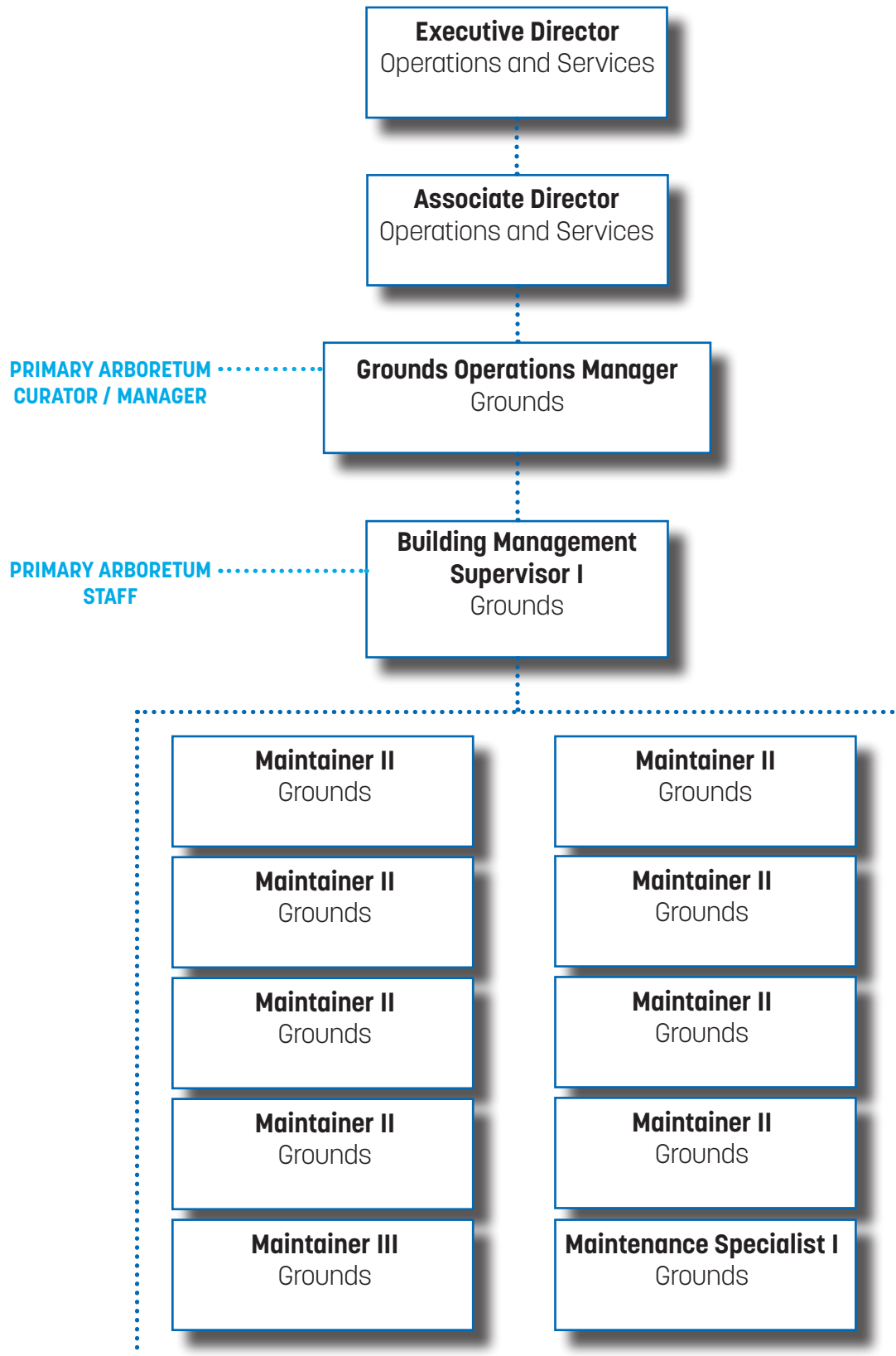
In scenarios where construction may impact the university's living collections, care and consideration must be taken to limit the affected area and specimens, including soil disturbance and compaction, branch or trunk damage, hydrological or drainage changes, shading, etc. Appropriate tree and landscape protections shall be in place to protect adjacent collections during the length of construction. Refer to the UML Arboretum management plan section for more details.

9.3.1 Typical Reasons for Deaccessioning: During evaluations of individual specimens, conditions that routinely result in a decision to deaccession include:

- Plants exhibiting disease or decline due to numerous factors such as incompatibility with climate, poor stock, mishandling, etc.

- Plants deemed to be redundant for mission fulfillment, or of no current or likely future use under provisions of the arboretum collections policy.
- Plant material requiring excessive maintenance effort not justified by the benefits of retaining it in the collection.
- Plant material that may be readily and economically obtained in the commercial trade at a lower cost than is required to maintain in the collection.

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PLANNING

TERMS & DEFINITIONS

Accession - The acquisition of an individual plant specimen regardless of taxonomic or cultivar designation which is recorded with a unique identifier for recordkeeping.

ANSI - American National Standards Institute.

Biomorphic - Design suggestive of forms and patterns found in the natural world.

Collection - A particular grouping of plant specimens, regardless of spatial arrangement, which create educational value through interpretation or investigation.

Commemorative Tree - Trees dedicated to a prominent individual, either living or deceased, through the application of a label signifier.

CRZ - Critical Root Zone, the zone in which tree root density is greatest and is variable based on tree age, species and site context.

Cultivar - A plant of a particular species bred or propagated for desirable characteristics.

DBH - Diameter Breast Height.

Deaccession - The act of removing a plant accession from an arboretum collection.

Ecosystem Services - Varied services provided to humans from properly functioning ecosystems and components of ecosystems which include food provisioning, climate regulation, stormwater filtration, etc.

Ericaceous - Denoting plants from the heather family Ericaceae.

Fastigate - Plants displaying an upright growth pattern, where branches are more or less parallel to the main stem.

Genera / Genus - A principal taxonomic category that ranks below family and above species.

GIS - Geographic Information System, often used in digital display and analysis programs like Autodesk ArcGIS.

ISA - International Society of Arboriculture.

Microclimate - The climate patterns of a very small zone, relatively outside those of the surrounding area. Often corresponds to slope, aspect, solar exposure, environmental sheltering and shadow impacts.

Nativar - A native plant species selected for certain desirable characteristics.

Provenance - A plant's original or earliest recorded place of origin. Often referred to as the source of the plant material.

Species - A principal taxonomic category that ranks below family and species, and defines variants, selections and cultivars or hybrids.

Taxon / Taxa / Taxonomic - The classification of plants through class, family, genus and species, which forms relationships between plant evolutionary lineages.

