TREE MANAGEMENT PLAN

LANDCARE
UNIVERSITY OF MINNESOTA

Twin Cities Campus Tree Management Plan

December 2023

FACILITIES MANAGEMENT – LANDCARE
Food Operations Building, Suite 150 2904 Fairmount St SE Minneapolis, MN 55414
z.umn.edu/landcare

TABLE OF CONTENTS

INTRODUCTION

The University of Minnesota Twin Cities Landcare unit presents a beautiful, safe, and accessible exterior environment for campus users throughout the year. As part of the Facilities Management team, Landcare provides efficient, cost-effective stewardship of natural and built campus assets in support of learning and discovery.

Campus trees provide many ecosystem services, including carbon sequestration, pollinator habitat, aesthetic quality, cultural resources, and research opportunities. Landcare's tree program includes a full service, in-house crew who maintain more than 11,000 trees and 15 wooded sites on the Twin Cities Campus. Annual expenditures specific to tree-related activities total ~$500,000 annually including labor, equipment, materials, training, and more.

This tree management plan began in draft form on 10/15/15.

PURPOSE

The purpose of the University of Minnesota Twin Cities Campus Tree Management Plan is as follows:

- **Inventory & assess** – quantify and qualify urban tree assets on Twin Cities campus.
- **Protect & maintain** – communicate expectations for tree maintenance and protection.
- **Plan & implement** – document campus tree standards and future goals.

COMMUNICATION STRATEGY

This tree management plan speaks to a wide audience that includes Landcare staff, campus planners, contractors, students, researchers, and the broader campus community. Clear and concise communication is achieved with standards, mapping, tables, and visuals. The current version of the tree management plan is posted on Landcare's public website. The plan is reviewed annually with the Landcare tree crew, and is made available to key campus stakeholders.

RESPONSIBLE AUTHORITY

Landcare, a service unit within Facilities Management, is responsible for stewardship of campus trees and all arboricultural-related activities on the University of Minnesota Twin Cities campus. The Landcare Assistant Director has final authority, the University Landcape Architect guides the planning and design, the University Arborist manages the daily operations, and the team of Arborists perform the field work.

TREE ADVISORY COMMITTEE

The Campus Tree Advisory Committee meets quarterly and serves the following roles:

- Educates the campus population on the benefits of campus trees.
- Develops connectivity to the community.
- Provides input for future planning and goals.
- Promotes the Twin Cities Campus Tree Management Plan.

Committee Members:

- Assistant Director, UMN Landcare
- University Arborist, UMN Landcare
- Campus community resident
- Faculty member, UMN/Landscape Architecture
- Faculty member, UMN/Urban and Community Forestry
- Research scientist, UMN/Urban and Community Forestry
- Student member, UMN Forestry Club and/or UMN Tree Ascension Group

INVENTORY

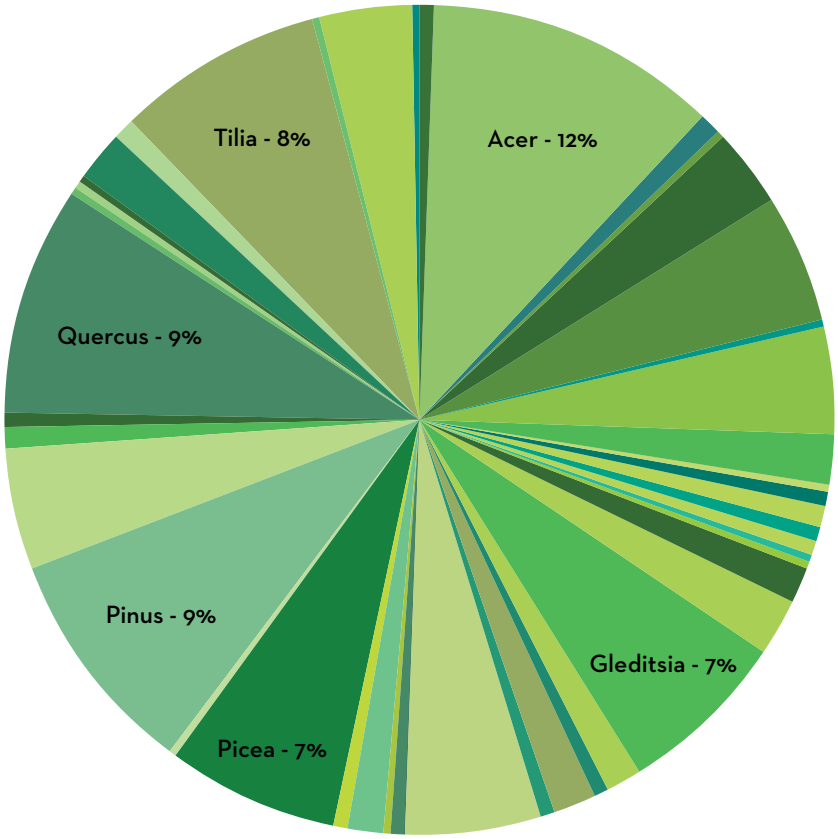
The Twin Cities campus tree inventory of approximately 11,000 trees and 15 urban woodland sites is documented with a geographic information systems (GIS) map.

TREE GENUS & SPECIES

There are currently 59 different genera of campus trees that are recorded in GIS. Since many tree pests attack at the genus level, inventory thresholds and species selections are based on the percentage of each genus compared to the total tree population. (For example, 1,100 Acer in the total population of 10,000 trees equals 11% Acer).

Current Inventory
Of the 59 genera, currently only six exceed the 5% threshold – Acer (11.55%), Quercus (9.02%), Pinus (8.91%), Tilia (7.9%), Picea (6.76%), and Gleditsia (6.64%).

2023 Campus Tree Population by Genus



Inventory Goal
Landcare's goal is for each genus to be at or below 5% of the total tree population. This will be achieved using the following strategies:

- **Remove noxious weeds** – Amur and Norway maple (both Acer) are two examples of specially regulated plants; control methods of seedlings and opportunities for removal will be considered. For example, if 150 Amur and Norway maple are removed, the Acer percentage would drop -1%.
- **Increase inventory** – plant more trees (of low percentage genus) to increase the denominator and decrease the high percentage genera. For example, if 1,000 more non-Acer trees are planted, the Acer percentage would drop -1%.
- ***Quercus* Exemption** – with *Quercus* being an integral part of the history and character of the Twin Cities campus, they are exempt from the 5% rule provided they do not exceed an unreasonable threshold. Careful consideration is given to their planting.

GIS DATA MANAGEMENT

Each landscape tree is represented by a point, and wooded areas are shown as polygons. Each tree has an attribute table that tracks over 10 items including tree ID, campus, genus, species, cultivar, tree type, date planted, date removed, DBH (for each year), and planting stock type. This is a public map.

The accuracy of the data is critical to effective tree management, and Landcare strives to update records in real-time. Treatments such as removals, pruning, and injections typically have data entered within the same day of occurrence. New trees are typically mapped twice per year (following the spring and fall planting seasons), and the tree's attribute table is initially populated at that time.

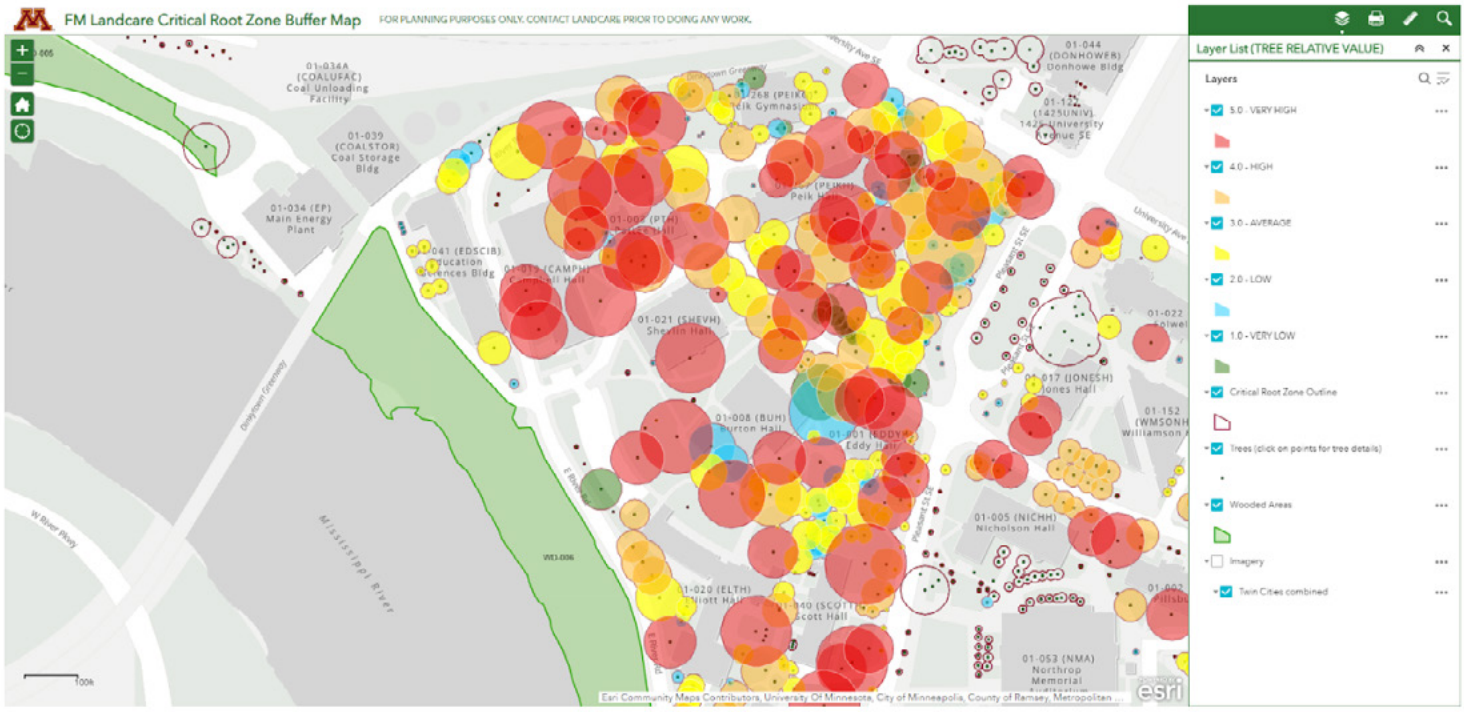
GIS MAP USE

Landcare uses GIS for maintenance tracking and work planning. The same data set is used to create other helpful maps which are intended for internal campus planning and are not shared with the general public.

Relative Value Map

This map is used primarily by Landcare and University Planning staff to guide campus development. Specifically, the map illustrates two things:

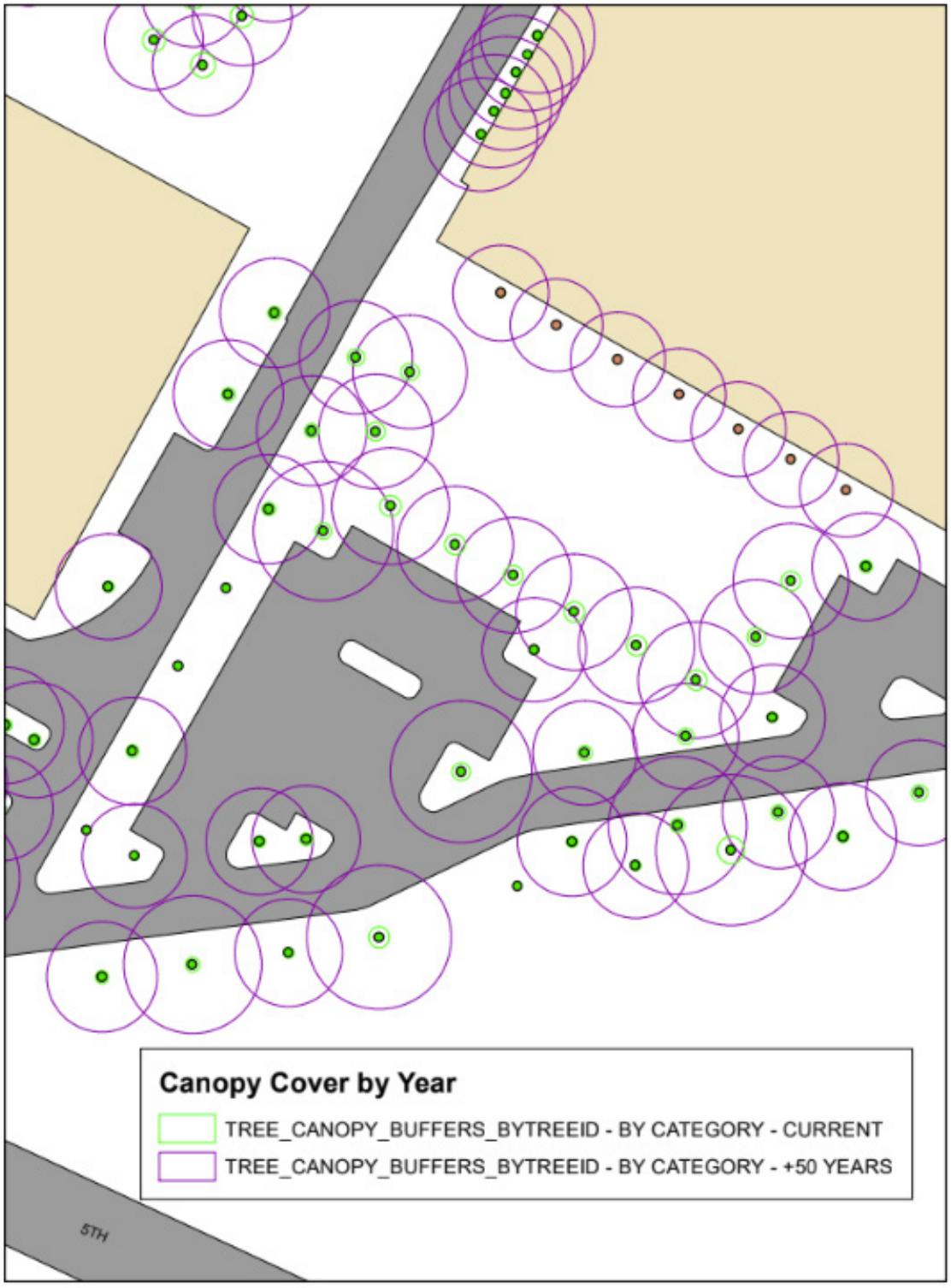
- **Critical root zone** – the approximate limits of the tree's root zone.
- **Relative value** – a 1-5 scale of the tree's importance; this is described in detail in the Assessment section.



Tree Relative Value Map

Tree Canopy Cover

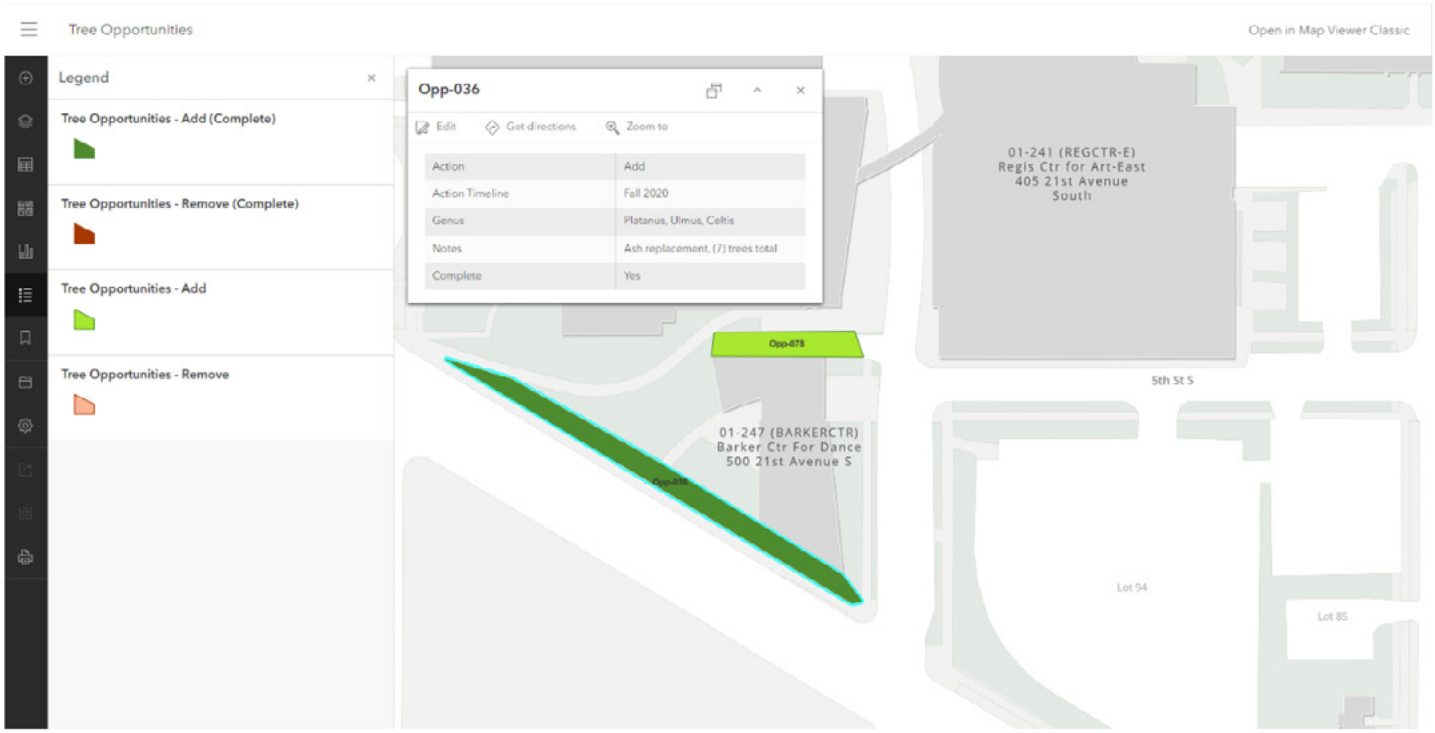
This map is used by Landcare to help understand our current and future canopy cover. Using real campus data for tree DBH growth rates in each genus, the map projects and illustrates the future growth of trees. This helps show areas that may be over or under-planted. In the visual below, the small green rings show the canopy as of 2020 when the trees were newly planted, and the purple rings show the projected canopy size 50 years later in 2070.



Tree Canopy Cover Map

Tree Opportunities

This map is used by the University Landscape Architect and University Arborist to document areas that are suitable for new planting and potential removal/replacement. Simple polygons and basic attribute tables are used to capture brief notes, projected timelines, and completion status.



Tree Opportunities Map

ASSESSMENT

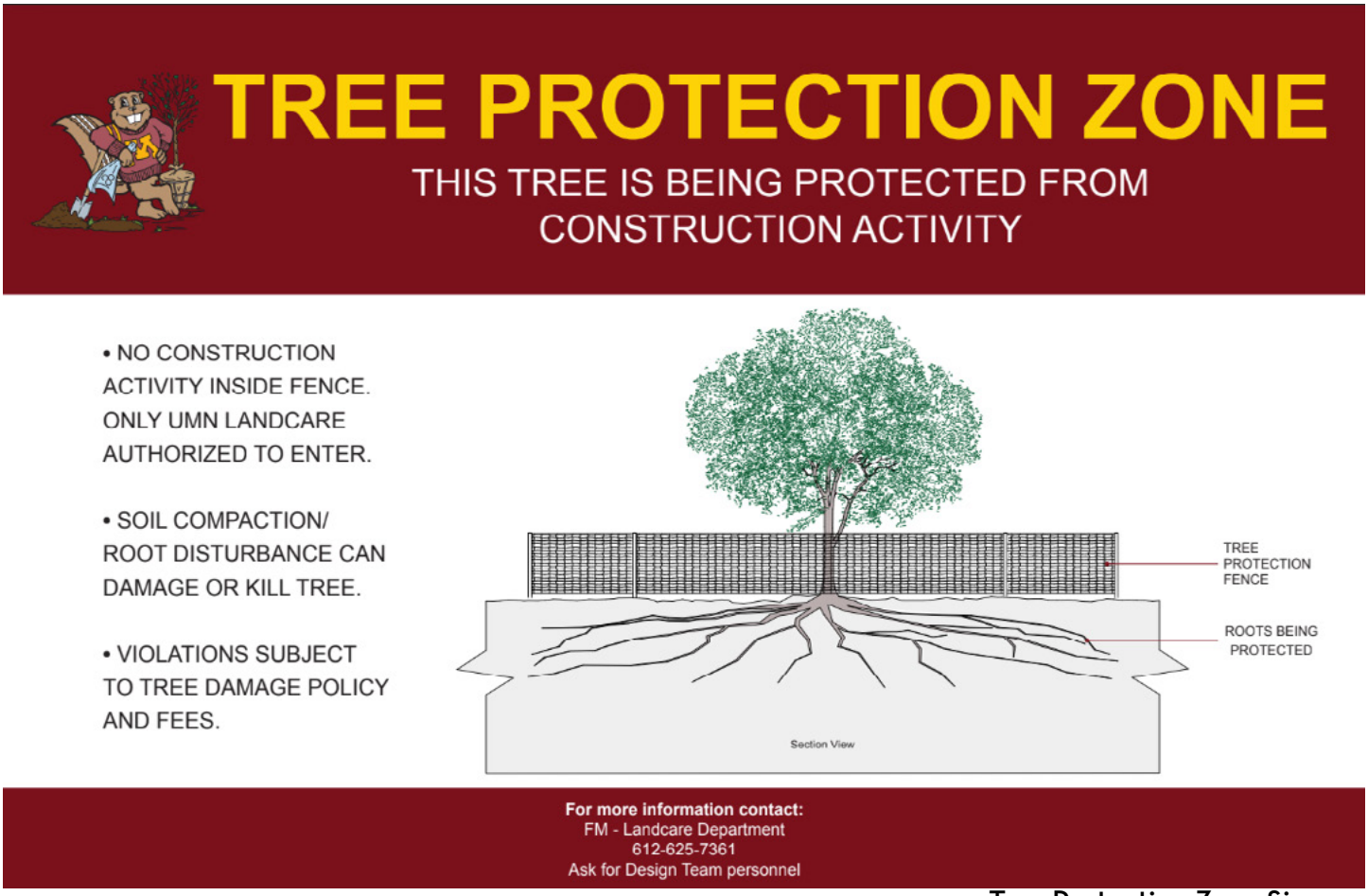
TREE ASSESSMENT

Landcare's tree risk assessment plan is fully integrated with the other facets of tree care, such as tree selection, planting, pruning, inspection, and preservation. Landcare uses the International Society of Arboriculture's (ISA) Tree Risk Assessment Qualification (TRAQ) model when assessing trees. The level 1 assessment produces a relative tree value score 1-5, a level 2 assessment provides a tree's risk rating, and a level 3 assessment provides more information about a specific tree part or concern. Further details are in Appendix A: Tree Risk Assessment Process.

TREE PROTECTION PROCESS & STANDARDS

When a construction project is in pre-design, the University's Capital Project Management (CPM) team must involve Landcare's University Landscape Architect and University Arborist in advising on trees that would potentially be affected. The full scope is detailed in Appendix B: Tree Protection Process, and below are the key elements at each stage of the project:

- **Pre-construction** – update assessments, determine trees to protect, meet on site with all parties, establish tree protection zone, plan & execute preventative tree care, and install tree protection.
- **During construction** – monitor trees, communicate with contractors, and intervene when tree care is needed.
- **Post-construction** – assess trees, perform therapeutic treatments to mitigate construction damage, and monitor tree health for multiple years.



Tree Protection Zone Signage

TREE VALUATION

As described in the 'tree assessment' section, Landcare conducts level 1 assessments during the pre-construction phase. This results in a relative tree value score of 1-5 which is meant to convey level of importance to the campus. Generally speaking, projects should avoid construction near higher-value trees, whereas construction activities impacting lower-value trees may be acceptable. Landcare staff are available through all phases of campus development projects to assist with tree protection.

The University determines which trees are to be preserved during construction. If it is not possible to work around and preserve specific trees, monetary values will be calculated based on a modified version of the trunk formula method which considers the following factors:

- **Tree size** – trunk radius measured at 4.5 feet above grade.
- **Replacement cost** – using the largest commonly-available transplantable tree.
- **Species rating** – including a species' hardiness, structural integrity, longevity, and biotic tolerance.
- **Assessment score** – incorporating the tree's ratings for condition and location.

This method is used for trees 9" diameter and greater. For trees under 9" diameter, the installed tree cost is used.

TREE DAMAGE

Adherence to tree protection requirements is crucial to help preserve the aesthetic and character of campus trees, maximize their ecological benefits, and demonstrate best management practices to academic partners. Projects involving conflicts with trees should follow the 'tree protection process.' Contractors must exercise caution to avoid damage when working near trees, and notify Landcare of any concerns related to tree and/or root interference with the project, including any changes in scope of work.

If damage occurs to tree bark, branches, trunk, roots, or root zone, it must be reported to the project manager and Landcare immediately. Construction activities resulting in tree damage will be subject to penalty. The tree damage policy and fees are detailed in Appendix C: Tree Protection Standards.

PLANTING

SPECIES SELECTION & PROHIBITED SPECIES

Tree Canopy Cover

Under the direction of the University Landscape Architect and University Arborist, tree species are selected using the following considerations:

- **Inventory goal** – the goal listed in the 'Inventory' section for each genus to be at or below 5% of the total tree population shall be prioritized; selections that exacerbates the problem of some genera must be avoided (e.g. instead of picea & pinus, select less-populated evergreens).
- **Design intent** – in addition to considering the site's cultural requirements, select trees and placement that compliment and reinforce the design intent (ie: form, texture, focal point, summer shade, screening, etc.).
- **Tree opportunities** – consult the Landcare 'tree opportunities' GIS map to see if future tree planning is already underway.
- **Customer requests** – these are considered on a case-by-case basis and will follow the same selection process.

Prohibited Species

Species designated 'prohibited' by the Minnesota Department of Agriculture and the Minnesota Noxious Weed List will not be planted on campus. Species from genera exceeding 5% of campus trees will be avoided. Among other objectives, tree selection is intended to increase campus biodiversity.

TREE REPLACEMENT

Annual Replacement

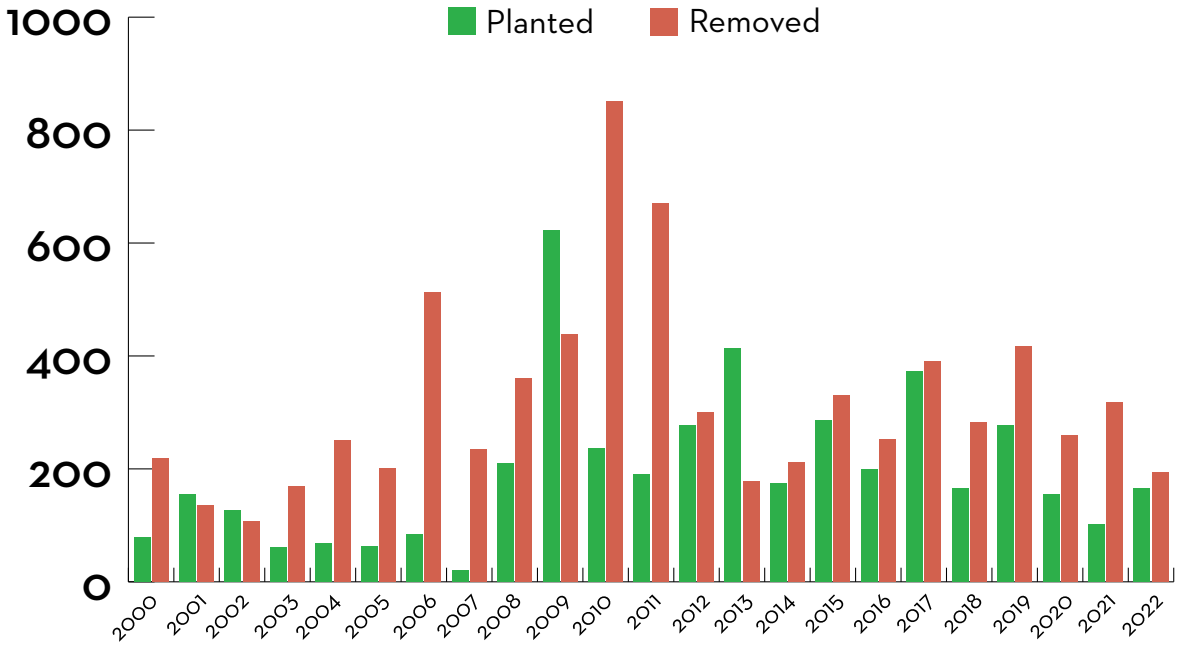
Landcare's annual tree replacement program focuses planting efforts where trees were removed recently due to storm damage or other failure. Most of the planting occurs in the fall using bare root stock from the gravel bed but containerized and B&B trees are also planted. Below are planting considerations and intended timeframes:

- **Climate adaptability** – some trees are selected for replacements due to their resilience, urban adaptability, climate change vulnerability, hardiness, and heat zone suitability.
- **Tree removal** – occurs primarily from May-September, but can occur throughout the entire year.
- **Stump removal** – majority of stump grinding occurs early summer the year after removal, but highly visible or other selected stumps are ground and restored immediately after tree removal.
- **Site analysis** – from midsummer through fall, planning occurs for the following year's spring or fall planting.
- **Tree planting** – select springtime plantings occur, but the majority of replacements are in the fall.
- **Example** – an example of the standard tree replacement cycle would be as follows:
    - **Summer 2023** – tree removal
    - **Early Summer 2024** – stump removal and site restoration (mainly turf)
    - **Late Summer 2024** – site analysis and planning
    - **Spring or Fall 2025** – new tree is planted

Trees Planted vs. Removed

From 2000-2022, an annual average of 196 trees were planted and 317 were removed. A few outlying years show skewed data in either direction due to a significant pest infestation, grant funding, and large capital projects. This shows the campus tree population trending in the wrong direction with an average deficit of -121 trees per year; however, several opportunities are highlighted:

- **Planting goals** – must take tangible steps toward reducing the deficit, but it should be very attainable.
- **Young tree maintenance** – should continue planting the number of trees that can be maintained to thrive rather than focusing on a positive plant : remove ratio - i.e. avoid planting more trees than can be maintained.
- **Staffing** – if more labor resources are allocated toward tree care, more young trees could be planted and thrive.



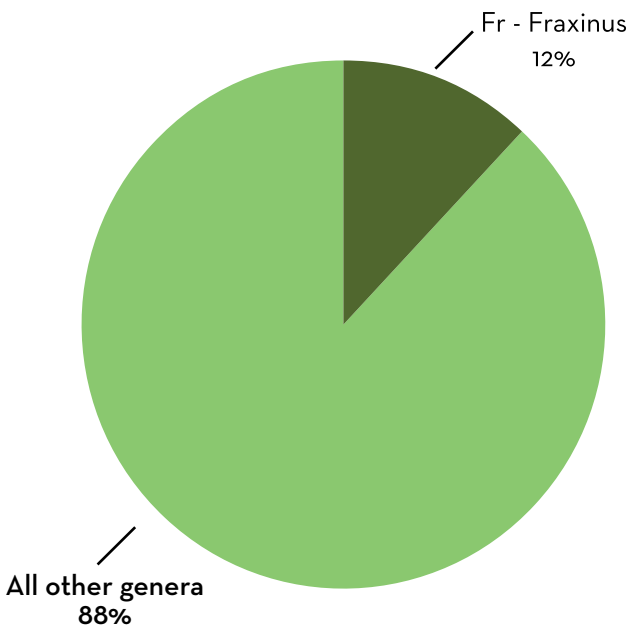
Trees Planted vs. Removed - Twin Cities Campus

Emerald Ash Borer (EAB) Response

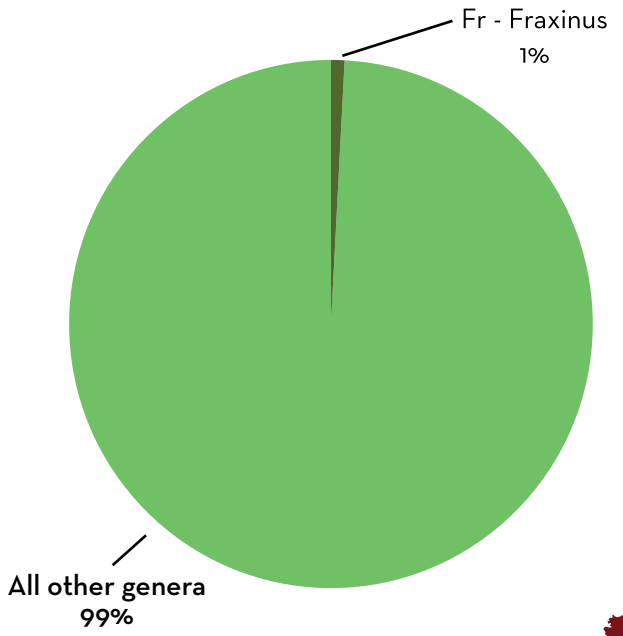
From 2008-2019, the largest influencer of tree replacements was Emerald Ash Borer (EAB), which was discovered in St. Paul, Minnesota in May 2009. In the 10 years that followed, most campus Ash trees were preemptively removed to help control the spread of EAB while only a small percentage were selected to be preserved.

- **2008 Ash population** – 1,507 trees, 12% of total population
- **2023 Ash population** – 135 trees, 1% of total population; all are protected against EAB

2008 Campus Tree Population by Genus



2023 Campus Tree Population by Genus



Reduction of Genus Fraxinus as % of Total

Street Tree Replacement Plan
The street tree replacement plantings are designed to include greater biodiversity, and thereby greater resilience to future ecological threats. The detailed plan can be viewed in Appendix D: Street Tree Planting Plan, but the main criteria include the following:

- **3 different genera** – planting is comprised of three species, from three separate genera (i.e. no two species from same genus in same planting).
- **Limited repetition** – planting is contained within a street boulevard for a maximum of three blocks.
- **Similar features** – trees should be similar in size, habit, form and features (e.g. fall color).

Repair & Replacement (R&R) Projects
Landcare uses R&R funding to make campus landscape repairs each year. While this can include many aspects of the landscape, new trees are always a consideration and could include specimen, street trees, or removal and replacement.

Capital Projects
Large projects typically include tree planting in the scope of work.

PLANTING STANDARDS

Trees are typically planted as part of site-specific campus improvement projects or large-scale capital projects. Whether planted by in-house staff, contractors, or volunteers, trees shall be planted in accordance to the Landcare L300 Planting Detail in Appendix E, and as described below:

Planting Specifications

- **B&B and tags** – remove burlap, all twine, tags, & wire basket from top half of root ball.
- **Excavation** – dig a minimum of 12" wider than root ball, scarify sides of planting hole, and set root ball on undisturbed or compacted soil.
- **Planting depth** – remove excess soil from root ball to expose main order root to determine excavation depth. Botton of main order root shall be within +/- 1" of finished grade.
- **SGRs** – remove stem girdling roots.
- **Backfill** – use planting soil in 8" lifts compacting each lift to eliminate air pockets.
- **Mulch** – 3" depth mulch at minimum 18" radius from tree trunk. Mulch shall be installed in a donut shape around the trunk with no mulch touching the main stem.
- **Water** – water root zone thoroughly.
- **Pruning** – remove only diseased, dead, or broken branches.
- **Slopes** – the uphill side dictates the planting depth, and the downhill side will be filled and graded as necessary.

NURSERY SELECTION & HANDLING TREES

Inspection
Landcare staff shall reasonably inspect trees upon delivery for quality of main stem, branching structure, and root ball. If insurmountable defects are present, staff must notify their supervisor so an exchange with higher quality plant stock can be coordinated. Examples of unacceptable defects include the following:

- **Girdled stem** – when twine has been tied around the stem so long that there is stem damage.
- **Excessive wound** – when branch has torn and damaged the main stem, or if large stem wounds are present.
- **Diseased** – when main stem appears to be unhealthy or has symptoms of cankers, spores, etc.

Hand Selection
For planting projects with a large quantity of trees and/or special circumstances, the University Landscape Architect or University Arborist may choose to hand-select individual trees from the nursery to optimize tree health and structure.

Loading & Handling
Great care shall be taken when trees are being handled, loaded/unloaded, transported, and planted. Whether using equipment or by hand, be mindful of the following:

- **Protect main stem** – treat the terminal end of the stem delicately and avoid damaging or scratching the bark.
- **Manage root ball** – avoid squeezing or crushing the root ball and keep the soil intact.
- **Use proper lifting** – carry trees by the root ball, not the stem; use team lifts, ball carts, or equipment.

Crabapples in Bloom on East Bank Campus

TRANSPLANTING

As an alternative to removal, trees should be transplanted using the following considerations:

- **Tree size** – large trees may be cost-prohibitive; small trees may not be cost-effective.
- **Tree type** – some types or species have varying degrees of survivability.
- **Time of year** – generally, suitable times may be prior to bud break, after new growth hardens, or after leaf drop; project timelines may not accommodate the best transplant window.
- **Access** – there may be limiting factors such as slopes, utilities, hardscapes, and more.
- **Collateral damage** – adjacent landscape features, plants, or roots may be damaged.

Landcare Staff Harvesting Gravel Bed Stock

- **Cost of replacement** – the most cost-effective method may be to remove and replace.
- **Suitability of new site** – the new destination must be accessible and ready for planting.
- **Quality of roots** – depending on methods, the roots may be in a contained root ball or too damaged for successful transplanting.
- **Relative value** – the tree may or may not have unique significance to a given site.

MAINTENANCE

When applicable, Landcare uses International Society of Arboriculture (ISA) best management practices and follows standards set forth by American National Standards Institute (ANSI) A300 and Z133. The sections below describe how trees are managed.

WATERING

Irrigation is used during new tree establishment, drought conditions, and throughout projects that threaten the health and vigor of trees. Watering frequency will vary based on tree type, site conditions, weather, and more.

- **New trees** – trees in the ground for five years or less will receive regular monitoring; a watering bag shall be used unless it hinders tree establishment.
- **Underground irrigation** – many trees are growing within the limits of the campus irrigation system; young trees are still monitored regularly, but hand-watering occurs less frequently.
- **Trees during construction** – protected trees will be monitored and watered in accordance with the 'Assessment' and 'Tree Protection' sections.

MULCHING

In addition to mulching at the time of planting as described in the 'Planting Standards' section, the following considerations apply:

- **Trees in turf** – no tree shall be grown directly in turf; a minimum 18" radius mulch ring should be installed to increase tree health and decrease the potential for mechanical damage.
- **Trees in landscape beds** – trees should be incorporated into planted beds where practical.
- **Weeds in mulch rings** – tree mulch rings should remain weed free, and great care must be used when removing or spraying weeds to avoid inadvertent damage to the tree.
- **Large mulch rings** – to highlight select trees or as a means of preventative or therapeutic treatment, mulch rings may extend as far as the dripline of large trees.

MEASURING DBH

Diameter at breast height (DBH) is measured at 4.5' and updated in GIS every time a tree treatment or inspection occurs. Appendix F: Measuring DBH Standards illustrates how to measure and report DBH.

PRUNING

Pruning Types

Pruning is prioritized by public safety, tree structure, then aesthetics. Each tree shall be assessed prior to pruning for recent growth and general health – pruning may not be appropriate. Specific pruning types are detailed in Table 1 of the Tree Pruning Matrix in Appendix G.

Pruning Cycle

At a minimum, all trees on campus should be inspected, measured for DBH, and updated every five years. To differentiate pruning objectives between trees of different sizes, trees are categorized based on type and size as specified in Table 2 of Appendix G.

Priorities & Timing

- **Dormant season** – primary window to perform structural pruning.
- **Early spring** – safety-related maintenance pruning occurs, but other pruning pauses until buds break and leaves are fully expanded.
- **Late spring/summer** – maintenance pruning occurs assuming while taking care to avoid spreading disease.
- **Fall** – safety-related maintenance pruning occurs, but other pruning pauses until leaves fully drop and buds harden to minimize die-back.
- **Disease susceptibility** – avoid pruning species that are susceptible to disease during the growing season or when improper weather conditions are present (e.g. oak, honeylocust, crabapple, mountain ash, hawthorn, and serviceberry). If it is necessary to prune disease-susceptible trees during the wrong conditions, care must be taken to minimize the risk of spreading disease including sanitizing tools and applying shellac to wounds.and buds harden to minimize die-back.
- **Flowering ornamentals** – if flower buds form on last year's growth, wait to prune until the trees are done flowering if possible.and buds harden to minimize die-back.

REMOVAL

Tree removal shall be considered the absolute last resort once other risk mitigation strategies have been explored. While reasons for removal are sometimes very apparent, careful consideration occurs because once the tree is gone, there is no putting it back. All tree removals must be authorized by the Landcare Assistant Director.

Reasons for Removal

- **Standing dead** – once dead, trees will increasingly become a liability and shall be removed; trees with substantial canopy loss may be considered for removal if deemed appropriate.
- **Storm damage** – wind, snow, ice, or other environmental extremes that cause a tree to fail beyond repair.
- **Structurally unsafe** – when branches, stems, roots, or any other compromised tree parts causes the tree to exceed an acceptable risk threshold.
- **Project opportunities** – as described in the 'Assessment' section, tree protection and preservation are important to maintain campus character and history; however, there may be tree removal opportunities during campus development that are appropriate.and buds harden to minimize die-back.

Landcare Staff Addressing Limb Failure at Campbell Hall

PLANT HEALTH CARE (PHC)

To maintain strong, healthy trees that can withstand some pressure from pests and diseases, it is critical to have an effective plan. Landcare uses the Integrated Pest Management (IPM) model, and lead workers maintain a valid pesticide applicator license through continuing education.

Pest & Disease Scouting

On the Twin Cities campus, the main tree pest and disease issues are Dutch Elm Disease (DED), Emerald Ash Borer (EAB), and Oak Wilt (OW). There are other issues with insects and leaf & needle diseases, but DED, EAB, and OW require the most intervention, funding, and labor resources. The following strategies are used:

- **Maintain tree health** – build strong defense systems by proactively keeping trees happy.
- **Scout effectively** – understand the pest life cycle and concentrate efforts in areas susceptible to high pest pressure or with a history of pest problems.
- **Target high value trees** – focus on large trees that provide the greatest value to campus.
- **Use on-campus resources** – seek guidance from the Plant Disease Clinic and/or the Soil Testing Laboratory. Listen to feedback from Urban forestry Outreach & Research personnel and students & staff in the College of Food, Agriculture and Natural Resource Sciences (CFANS).

Air Excavation

Urban soils on campus can be very poor due to compaction, limited soil volume & nutrients, and competing plant material. The high-pressure air excavation methods listed below should be used to help reduce compaction, introduce better growing medium, alleviate soil issues, and maintain a healthy root system. These are illustrated in Appendix H: Air Excavation Standards.

- **Root collar excavation** – used to inspect root collars, unbury trees, & remove stem-girdling roots where excavation is at the base of the trunk.
- **Sheet excavation** – used to amend entire available root zone (such as a tree coffin) where excavation is ~4'< around perimeter of trunk.
- **Vertical mulch** – used for large areas or in turf spaces out to a tree's drip line with a grid pattern of holes ~4' on center.
- **Radial trench** – used for medium-sized areas or mulched spaces in a hub & spoke pattern with long trenches.

Radial Trenching

Vertical Mulching

Chemical Application

Once a pest or disease problem becomes evident during the scouting process, sometimes chemical applications are part of the solution to improve tree health. This may include the controlled use of insecticides, fungicides, herbicides, and plant growth regulators.

STUMPS, SGRs, & SUPPORTS

Stump Removal

Once a tree is removed and flush cut close to grade, below are the standards for dealing with the stump:

- **Timing** – the majority of stump grinding occurs early summer the year after tree removal, but highly visible or other selected stumps may be ground & restored immediately after tree removal.
- **Pulling stumps** – small stumps may be pulled out in lieu of grinding provided there is not increased risk of damage to underground utilities and adequate volume of backfill is used.
- **Grinding depth** – stumps shall be ground to a minimum depth of 12" below grade unless extenuating circumstances necessitate a shallower depth.
- **Surface roots** – all visible surface roots shall be chased and ground until the top of the root dives below grade a minimum of 2".
- **Grindings & backfill** – for stumps within turf, grindings shall be dug out, and the hole shall be filled with a minimum of 6" standard campus mix soil; for stumps within planted beds, grindings can be stuffed back in the hole and leveled until they are flush with grade.
- **Restoration** – for stumps within turf, soil shall be foot-packed in lifts, raked flush with existing grade, then seeded/sodded/hydroseeded as appropriate.

Stem-Girdling Roots (SGRs)

SGRs should be removed at the time of planting, but they do redevelop and create issues for tree health, vitality, and stability. Landcare manages SGRs as follows:

- **Scout for symptoms** – inspect species that are prone to SGRs, show physical symptoms, and are generally in the 5-15" DBH range.
- **Air excavate** – excavate root collar 360° and as deep as necessary to uncover problematic roots.
- **Root prune** – cleanly cut off roots that are choking the stem, ideally when they are small; avoid removing an excessive amount of roots.
- **Monitor** – keep a close eye on trees for several seasons to monitor tree health; provide care as needed including watering and maintaining an adequate mulch ring.

Root Collar Excavation Revealing Stem Girdling Roots

Support Systems
Trees are evaluated for support systems which may include cabling, bracing, guying, and propping. If supplemental support systems are deemed appropriate, Landcare consults the ANSI A300 standard and best management practices. Considerations for adding support systems include trees that are newly planted, have poorly attached branches, co-dominant leads, included bark, or other attributes. Pruning may be used in combination with installing support systems to help reduce load.

Stem Protection
Young trees are susceptible to stem damage due to sunscald, animals, landscape maintenance equipment, and other factors. Landcare may install stem protection using criteria in Appendix I: Stem Protection & Wrapping Standards.

Trees near construction may also warrant stem protection during the project. Depending on the scope of work, anticipated duration, and the contractor's means & methods, stems may be barricaded, fenced off, or wrapped in protective materials. This is discussed in the above section 'tree protection process & standards.'

STAKING

Some trees may require support due to small, light root balls, top-heavy canopies, or exposure to strong wind. Only if it is determined that a tree needs additional support, the installer will choose the approved materials and methods below:

Materials

- **Upright stakes** – dark green 6' tall steel T-posts.
- **Support stakes** – gray or dark green fiberglass stakes, 4-6' tall x 1/4-5/8" diameter.
- **Guy stakes** – wood grade stakes w/ natural wood tone, 2-3' length.
- **Root ball stakes** – natural wood tone lumber with horizontal brace pieces extending at least 6" longer than the width of the root ball, and the vertical anchor pieces penetrating at least 6" deep into the ground.
- **Tree tie or webbing** – dark green fiber material that is soft, smooth, and 3/4" wide.
- **Flexible ties** – dark-colored, flexible, and soft or rubber material.

Methods

- **Upright stake** – use this method for containerized and B&B stock that is top-heavy or has an undersized root ball. Space three matching stakes evenly around the tree. Place stakes upright, angled slightly away from the tree. Drive stake 12-18" deep into the soil so 4-5' is above grade – avoid damage to roots. Fasten a tree tie to each stake and loosely tie the other end around the main stem. Attach ties at approximately half the height of the tree and allow enough slack for the tree to sway naturally. The mulch ring should be large enough to encompass the stakes and eliminate a conflict with turf mowers.
- **Upright support** – use this method for bareroot stock or small trees with crooked leaders. Set one upright fiberglass stake near the trunk and drive it through the root ball into the ground 8-12"deep. Secure the trunk to the stake with a flexible tie.

- **Root ball** – use this method for small, containerized stock that is top-heavy or has an undersized root ball. Use two upside down, U-shaped stakes to secure the root ball on both sides of the stem. Drive each stake into the ground so the horizontal piece is firmly holding the root ball in place – avoid damage to roots. The mulch ring should be large enough to encompass the stakes and eliminate a conflict with turf mowers.

- **Guying** – use this method for bareroot, containerized, or B&B stock that is top-heavy or has an undersized root ball. Space three matching stakes evenly around the tree. Place stakes angled away from the tree and drive them 6-12" deep into the soil so 1-1.5' is above grade. Fasten tree tie to each stake and loosely tie the other end around the main stem in the lower half of the tree. Tree tie should be at a 45-degree angle between the tree and the anchor and should allow enough slack for the tree to sway naturally. The mulch ring should be large enough to encompass the stakes and eliminate a conflict with turf mowers.

URBAN WOODLAND AREA MANAGEMENT

Campus wooded areas are predominantly remnant patches of mixed deciduous forest. These areas are preserved as naturalistic landscapes to provide ecosystem benefits. They are not intended for general human use, and the appearance and maintenance practices are different from the individual trees on campus grounds.

Service type: Naturalistic

- **Deadwood** – large deadwood and standing dead trees remain on site to naturally decay.
- **Fallen material** – leaves, branches, and trees remain on the interior of the forest.

Service intensity

- **Woodland interiors: Responsive**
  - Tree maintenance may be limited to mitigating conflicts with significant ecological problems.
  - The likelihood of a tree impacting a human target is very low in these remote settings, so woodland interiors are generally considered low risk with very rare intervention.
  - Natural reforestation will occur without active removal or replanting efforts.

- **Woodland perimeters: Standard**
  - Woodland edges that border designated sidewalks, roadways, or parking areas (e.g. Transitway along Sarita) receive standard maintenance practices and inspections.

- **Exceptions**
  - Where security concerns exist in woodland areas, standard service intensity includes selective removal and pruning to improve visual surveillance.
  - Periodically scout for plants on the MN Noxious Weed List and take appropriate action based on the MN Department of Agriculture guidelines.
  - Tree planting may occur in select areas to advance tree management goals.

Examples of Campus Wooded Sites

There are over 15 campus wooded sites, and examples are listed below (* = standard service intensity along perimeter):

- **East Bank** – Hammer Throw, Mississippi River Bluff (E River Rd, Main Energy Plant, SE Steam Plant), Boynton, Ridder Tennis Courts, *Transitway
- **West Bank** – Middlebrook, *West Bank Ballfield
- **St. Paul** – Folwell Ave, *McNeal Woods, *Mullins Woods, *Sarita, *St. Paul Gym Woods, Trolley Line, University Grove Commons

SPECIAL CONSIDERATIONS

GOALS & TARGETS

Tree Canopy Cover

In addition to the goal for each genus to be at or below 5% of the total tree population as described in the "Inventory" section, Landcare is currently working to establish a canopy cover goal. The campus property is unique because it is continuously expanding and changing, and it contains an urban environment, research plots, agricultural fields, and woodland areas – not to mention that the Minneapolis campus is split by the Mississippi River. Determining a reasonable canopy cover goal requires a better understanding of the following factors:

- **Elements to include vs. exclude** – must decide how to frame the canopy cover goal considering non-plantable space such as riverbanks, hardscapes, building footprints, research plots, and agricultural fields.
- **Reporting method** – must finalize how to project current and future canopy cover (ie: using a formula based on DBH, aerial imagery, etc.)
- **Deliverables** – must decide how to display and communicate the current and future canopy cover (e.g. slide bar story map, table, etc.)

Other Campus Green Initiatives

Landcare service standards are on the public website, and these are periodically reviewed and updated. This explains the service levels in each area of landscape maintenance, and defines areas as follows:

- **Service type** – defines which areas of campus are considered formal, informal, and naturalistic.
- **Service intensity** – specifies which areas of campus receive enhanced, standard, or responsive service.

PROHIBITED PRACTICES

Bike locking

To help minimize mechanical damage to trees, bicycles and other similar transportation equipment shall not be locked to trees.

Unauthorized Climbing
The only people authorized to climb campus trees are Landcare employees, contractors & vendors approved by Landcare, and registered student groups approved by Landcare.

Hammocks & Slacklines
The use of hammocks and slacklines are allowed only when users adhere to the 'Outdoor Recreation' section in the University policy Using and Leasing University Outdoor Space: Twin Cities. This specifies the size of tree, type of materials, duration, and general location. If the criteria are not met, the use of hammocks and slacklines are not allowed.

Driving off Hard Surfaces
Vehicles on campus must remain on paved surfaces and take precautions to protect the landscape and the critical root zone of trees. They are not permitted to drive on turf, tree root zones, or other landscape spaces without authorization by Landcare. Landcare may approve temporary access to these spaces with the use of track mats, plywood, or mulch staging as ground protection.

WORKPLACE SAFETY

Tree crew personnel must be trained in proper work site safety. This includes but is not limited to tool staging & setup, call-response communication, PPE, basic electrical hazards, drop zone management, brush staging & disposal, and site cleanup. Employees are also required to complete monthly safety trainings as assigned by University Health, Safety, & Risk Management (HSRM). The tree crew should also maintain one membership seat on the Landcare Safety Improvement Committee due to the potential forhighly hazardous work.

STAFF TRAINING

Tree Crew staff are trained and authorized to operate forestry equipment including but not limited to the aerial lift truck, chip truck, wood chipper, skid loader, stump grinder, and chainsaw. Training records remain on file for each staff member for the duration of their employment. Staff are encouraged to participate in arboriculture continuing education throughout the year. These opportunities must be requested by the employee and are subject to budget allowances, labor needs, and supervisor approval. Post-training reporting/information-sharing may be required.

EMERGENCY PREPAREDNESS

While it is difficult to predict when catastrophic events may strike, efficient and effective response is dependent on the level of preparation. Landcare uses the strategies below to be prepared for emergencies.

Large Hackberry Failure on St. Paul Campus

Standard Operating Procedures (SOPs)
Part of onboarding for all Landcare positions is to be familiar with the SOPs. Depending on roles and responsibilities, employees are expected to read and understand SOPs related to equipment use, processes, and administrative functions. Below are a few examples of SOPs that help employees be prepared for the unexpected:

- **Accident reporting** – explains how employees respond in the event of an accident including who to notify and necessary action steps.
- **Barricading a job site** – explains and illustrates how to install barricades on a job site in the event of tree failure that affects a roadway or sidewalk.
- **Chemical spill reporting** – explains how employees notify bystanders, prevent access, clean up the spill, dispose of hazardous material, and report information to authorities.
- **Sharps disposal** – lists how to properly protect yourself when handling and disposing of sharps.

After Hours Response Flow Chart
Landcare supervisors periodically receive after-hours phone calls from the Department of Public Safety who are reporting campus problems and emergencies. These problems vary in complexity, severity, and time of day, so supervisors have created a flow chart to help guide them through assessing the situation, asking the right questions, and determining an appropriate response.

First Aid & CPR Training
Approximately 75% of Landcare employees have attended recent training in first aid and CPR. While the information and strategies may rarely be needed during an actual emergency, most workers are in the front lines and are exposed to countless opportunities to help maintain public safety on campus.

Collaboration with University Departments
Landcare staff maintains positive relationships with other University departments, and those connections are critical in the success and efficiency of problem-solving and decision-making during emergency situations. Though not a comprehensive list, Landcare regularly collaborates with Facilities Management (FM), Energy Management, FM Call Center, Waste Recovery Services, UConstruction, UMarket Services, Police Department, Parking & Transportation Services, and Health Safety & Risk Management.

TREE DEFINITIONS

Listed in alphabetical order, below are some common terms used in Landcare's arboriculture practices:

Drip line: An imaginary line that extends from the edge of the tree's canopy to the ground. This is the overall width of the tree.

Occupancy: The amount of time a target is in a target zone. In tree risk assessment, the occupancy rate can be rare, occasional, frequent, or constant.

Radial trenching: Soil improvement technique where the soil in the root zone is air excavated with trenches in a wheel & spoke fashion and amended with superior quality soil to improve tree health.

Reduction pruning: Selectively removing terminal portions of a branch to decrease length & load and reduce risk of failure. The lateral branch that remains should be at least 1/3 the diameter of the removed portion and be able to sustain life in that branch.

Target: People, property, or activities that could be injured, damaged, or disrupted by a tree failure. Targets can be static, movable, or mobile.

Tree protection zone (TPZ): Area surrounding the trunk, soil, and root zone that needs to be protected during construction to preserve tree health and stability. This is defined by trunk DBH (measured at 4.5') x 1.5' = Radius in feet. Barricades are installed along the TPZ perimeter during construction projects.

Tree risk assessment: A systematic process used to identify, analyze, and evaluate tree risk. An assessor quantifies and qualifies the likelihood of tree failure, the likelihood of the tree impacting a target, and the consequences of failure to determine a tree's risk rating.

APPENDICES


Huntington Bank
STADIUM