CAMPUS FOREST MANAGEMENT PLAN

The University of Michigan

Plant Building and Grounds Services

December, 2011
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THE UNIVERSITY OF MICHIGAN
CAMPUS FOREST MANAGEMENT PLAN
2011

VISION STATEMENT

The University of Michigan’s Campus Forest Management Plan (CFMP) identifies practices and procedures for the proper care and management of the urban forest on the Ann Arbor campus. The CFMP establishes long-term vision and direction for this resource by creating clear policies for tree planting, protection, preservation, tree maintenance and tree removals. An overarching goal of the CFMP is to ensure a vibrant, attractive, safe and sustainable campus forest that derives benefits to students, faculty, staff and the community it serves. The management of the campus forest is a collaborative effort of all of the members of the Plant Operations Forestry Crew and applies to all areas they maintain. The initial Campus Forest Management Plan was written in 2008 and revised in 2011.

PURPOSE OF MANAGEMENT PLAN

The purpose of the CFMP is to create a plan governing tree planting, maintenance, and tree removals that provides vision and allows for sustainable management. The University of Michigan campus forest is a vital asset to the community, and through sound practices, policies and responsible stewardship, will be conserved and managed to provide environmental, social and economic benefits today and into the future.

Specific plan objectives include:

- Maintain and protect campus trees and woodlots by minimizing and mitigating the impact of construction and development.
- Continue to promote age and species diversity through the wide use of native trees and non-invasive, non-native trees where appropriate.
- Ensure that all trees requiring removal due to mortality, injury or construction impacts are replaced in a timely and consistent manner.
- Provide for appropriate species selection comprised of high quality nursery stock, and proper planting by adherence to accepted planting procedures.
- Encourage and promote campus tree health by utilizing International Society of Arboriculture (ISA) best management practices, and following Plant Health Care (PHC) principles.
- Achieve 40% tree canopy cover on campus by 2025, through tree protection, preservation, replacement planting and new tree planting initiatives.
- Periodic updating of the Campus Tree Inventory to include refreshed data, new property acquisitions and upgrading tree locations with geographic information system (GIS) coordinates.
• Provide education to the campus community, citizens and contractors about the importance of the campus forest, and the protection and maintenance of trees as part of the growth and development process.

**RESPONSIBLE AUTHORITY FOR CFMP**

Enforcement of the Campus Forest Management Plan is the responsibility of the University Forester, who is the Senior Supervisor of Forestry and Horticulture Maintenance within the Plant Buildings and Grounds Services Department. The University Forester supervises the activities of the forestry crews that are responsible for the pruning, inspection, fertilizing, watering and insect/disease detection and prevention of the trees on campus. We also remove and plant new trees as necessary. All tree specific information is maintained and stored in our Tree Inventory Database.

**CAMPUS TREE ADVISORY COMMITTEE**

The University of Michigan has established a Campus Tree Advisory Committee comprised of representatives from facilities management, faculty, staff, students, the city of Ann Arbor and the private sector.

The Campus Tree Advisory Committee meets periodically, providing guidance and input on management plan components, including tree planting, maintenance and removal procedures. They also provide outreach and education to the Ann Arbor and University community on the value and benefits of campus trees, and help to connect us to the community at large for information exchange, program and service idea sharing, and for exploring the potential for combined local environmental goals, stewardship policy, etc.

**CAMPUS TREE CARE POLICIES**

**Tree Planting Policy**

*(This planting policy was developed by the International Society of Arboriculture (ISA))*

The ideal time to plant trees and shrubs is during the dormant season in the fall after leaf drop, or in early spring before budbreak. Weather conditions are cool and allow plants to establish roots in the new location before spring rains and summer heat stimulate new top growth. Trees properly maintained in the nursery or garden center, and given the appropriate care during transport to prevent damage, can be planted throughout the growing season. In either situation, proper handling during shipping, offloading and planting is essential to ensure a vital start and healthy future for new trees and shrubs.

Prior to planting, all underground utilities must be located and marked at least 72 hours in advance of digging operations. Contact the Miss Digg Underground Utility Locating Service at (800) 482-7171.
If the root stock of trees being planted is balled and burlapped, bare root or containerized, it is important to understand that in some cases the root system may have been reduced by perhaps 90 percent of its original size during the transplanting process. As a result of the trauma caused by this process, trees commonly exhibit what is known as transplant shock. Containerized trees may also experience transplant shock, particularly if they have circling roots that must be cut. Transplant shock is indicated by slow growth and reduced vigor following transplanting. Proper site preparation before and during planting, coupled with timely follow-up care will reduce the duration of transplant stress and allow the tree to quickly re-establish in its new location.

See ADDENDUM 1 for detailed step-by-step tree planting instructions and planting diagram.

Tree Maintenance Policy

The University of Michigan grounds maintenance policies are founded on the principles of plant health care (PHC), which is defined as a comprehensive system for managing the appearance, structure, and vitality of ornamental landscapes within our community’s expectations. PHC is a proactive, holistic management system that encompasses all aspects of landscape stewardship: site evaluation and preparation; plant selection, establishment, and cultivation; pest management; and, plant utilization and removal.

Tree inventory data is also used to help direct maintenance work planning, as are investigations and inspections conducted by Grounds Services Department staff. These are generated from observations, complaints or concerns filed by university faculty, students, staff, visitors, campus residents, etc.

Dead and dying campus trees, whether identified by the tree inventory, site inspection or outside request are verified and scheduled for removal promptly, as determined by the degree of risk that they pose.

Hazard tree reduction pruning, as well as routine tree pruning to provide adequate building, pedestrian and vehicle clearances, remove damaged limbs, and provide for improved form and vigor are also scheduled according to risk. Routine pruning is intended to be done campus-wide on 10-year pruning cycles.

The University of Michigan has a very diverse landscape. That diversity is planned, and has served us well in the context of having such a wide variety of trees, both in species and in age, so that the negative impacts from pest outbreaks or storm damage events are minimized. We use a variety of methods to monitor and improve species diversity, including using current tree inventory data. The database helps identify what species are represented on various campus sites, and in what concentration, and we can use this data to help direct planting operations that will eventually help us achieve a more desirable species mix. An ideal long range goal for species composition is to not have over 10% of our campus trees comprised by any one genus, and no more than 5% of trees comprised by any one species.
Established Lists of Accepted and Prohibited Tree Species

The University Forester and University Planners have a variety of locally developed listings to consult when deciding which trees to select for a particular planting project or landscape development. These lists include: (1) Recommended Alternatives to Ash Trees for Michigan’s Lower Peninsula (http://www.emeraldashborer.info/files/e2925.pdf); and, (2) Ohio Shade Trees and Biodiversity in the Urban Environment (http://shade-trees.tripod.com/).

While the Grounds Department does utilize a broad palette of plants both native and non-native with the intent of fostering a biologically diverse and aesthetically appealing landscape, we are very aware of the dangers of planting aggressive exotic species on campus.

There are several lists of locally invasive plant species available, including those developed by:
(1) Wildtype Native Plant Nursery (http://www.wildtypeplants.com/invasive.html); and,

Catastrophic Events Management

During severe weather conditions, such as intense electric storms, high wind events and ice storms, the partial and total failure of damaged and destroyed trees is unavoidable. During such events, Grounds Department employees will remove fallen trees and debris, and may in some instance need the outside assistance of a private tree firm. Campus streets and roadways are the first to be cleared, followed by access to the critical buildings, such as the hospital, power plant and administrative buildings, followed by student residences, libraries, classroom buildings, etc.

TREE PRESERVATION POLICY

Preserving, protecting, maintaining and expanding the campus tree canopy is a fundamental purpose of this management plan. If we are to provide a healthy and sustainable urban forest resource, existing tree canopy needs to be preserved. We also need to make sure that the resource is resilient to changing pressures through enhanced biodiversity and ecosystem health, is managed for long-term growth, and is comprised of a broad mixture of tree species and ages to allow for a continuous level of canopy cover.

An important purpose of the CFMP is to create and adopt an effective policy for tree preservation on the University of Michigan campus. Preservation, rather than relocation/removal, should be the first priority, especially for large specimen trees that have high location value or historical significance. Without such a policy, many
beautiful campus trees would be at risk of being lost during construction and development. If preservation of a particular tree is not possible, then relocation should be the second option. If this is not feasible due to tree size, location, condition or other factors, then tree removal becomes the last and least desirable option.

The preservation of existing trees in any campus environment is of the utmost importance. Many of the trees on campus are significant either due to their size or species, or because they have some historic identity. Large canopy trees may take 100 years or more to reach their full size. When a large tree is removed, the impact is immediate and a part of the campus history is lost. The removal of small- to mid-sized trees is not as dramatic; however, the impact on the future campus landscape is significant. When small- and mid-sized trees are removed today, we are eliminating the majestic large trees of the future. We enjoy the presence of large trees on campus today because of the preservation efforts of those who came before us.

Tree Preservation Policy and Procedures

The University of Michigan Tree Preservation Policy that was updated and approved in July, 2003 has evolved to reflect necessary changes in points of policy, guidelines and specific procedures that pertain to the protection, removal, transplanting and replacement of trees on the Ann Arbor Campuses.

Although the revised tree preservation policy, guidelines and procedures are still in draft form, they are currently in use and adhered to. Formal approval and adoption by the University is forthcoming, and these revisions are included as addendums to this CFMP.

See ADDENDUM 2 for Tree Preservation Policy. (2009 draft)
See ADDENDUM 3 for Tree Preservation Guidelines. (2009 draft)
See ADDENDUM 4 for Tree Preservation Procedures. (2009 draft)

TREE PROTECTION

When it is determined that existing trees are to be preserved, it becomes critical that they are protected during construction. Construction damage to existing trees is not always apparent, and deleterious effects of construction impacts may take years to emerge. The most common construction damage is root injury due to soil compaction.

Specific Procedures for Protecting Trees

Significant trees designated to remain and be protected during construction will be clearly identified on the site plans. The protective zone around each tree will also be clearly identified. The protective zone extends out to the tree’s drip line, and is better defined as the Critical Root Zone (CRZ). The CRZ is determined by measuring a radius from the tree’s trunk that is equal to one foot for each inch of tree diameter. (Example: A tree with an 18” trunk diameter would have a CRZ of 18 feet from the trunk of the tree. The CRZ would be an 18-foot circle with the tree’s trunk at the center of the circle.) The
minimum standard of protection is a zone that will extend to the tree canopy drip line. If this minimum standard is not met, the tree should not be considered protected.

(See Addendum 3, Tree Preservation Guidelines - Protection for complete guidelines on tree protection.)

Tree Relocation and Removal

The relocation of existing trees from the site will mean transplanting by either tree spade or by the ball and burlap method. When possible, such transplanting will be ideally done during the dormant season. The University Forester (UF) along with the University Planner (UP) will select the new tree location.

Tree removal involves cutting the tree down and disposing of the debris. The decision to remove a significant tree can only be made by the Associate Vice President of Facilities and Operations (AVPFO). This includes removals requested during any phase of a project, including the initial design phase and during construction operations.

In order to maintain the campus forest, significant trees to be removed will be replaced in kind by the project or agency responsible for the removal of the tree.

Specific Procedures for Removal and Relocation

(See Addendum 3, Tree Preservation Guidelines – Transplant, Removal/Replacement for complete guidelines on tree removal, tree replacement and tree relocation.)

GOALS AND TARGETS

- Achieve 40% tree canopy cover on University of Michigan Ann Arbor campus areas by 2025.
- Continue routine tree pruning cycle of 10 years for all trees along university streets and in the landscaped areas of North, Central and South Campus.
- Continue the North Campus Woodlot Conservation (NCWC) program to restore natural wooded areas by removing hazardous trees, culling out invasive species and clearing trails for improved public use.
- Complete Campus-wide Tree Inventory to include those areas of North Campus not yet inventoried, including the North Campus Research Complex.
- Complete GIS Tree Inventory as an upgrade/update to existing Tree Inventory. When this upgrade is complete, all tagged campus specimens contained in the current Tree Inventory will have Geographical Information System coordinates assigned to them. This effort is currently in progress, and should be completed during the 2012 fiscal year.
- Promote the conservation of our tree resources.
The benefits derived from the urban forest generally increase as tree size and canopy cover increase. Therefore, it is in the best interest of the University community to protect its existing tree resources from loss or depletion. It is not possible to indefinitely preserve individual trees, since each tree will eventually die. However, it is possible to preserve both our campus forest and natural woodlands by restricting the indiscriminate removal of trees in all age classes, and by making provisions for natural or human-assisted regeneration. This embodies the concept of conservation. If the approach used to attain this goal involves tree protection or "preservation,” it will be necessary to have information on the long-term survival and condition of individual trees. If woodland or forest conservation techniques are applied, the extent, composition, and condition of stands of trees should be documented. Both aerial and ground level photography provide a simple means for documenting the presence and condition of individual trees and stands of trees over time. Ground survey methods and inventory data can also be used to provide more detailed base line data against which change can be measured.

- Select, situate and maintain campus trees to maximize benefits & minimize costs.

Inappropriate tree selection is often the underlying cause for trees that become hazardous, are prone to breakage, or develop recurrent pest or disease problems. Inadequate planting sites are often responsible for poor tree growth and survival, and excessive hardscape damage. By identifying and subsequently avoiding undesirable tree species, inadequate planting site specifications, and inappropriate tree-site combinations, it is possible to minimize problem situations and their high maintenance costs. Such problems typically arise when tree species are not selected with proper attention to site limitations, when planting sites are not designed to provide a hospitable environment for tree growth, or when hardscape, utilities, and structures are not properly engineered to withstand impacts associated with nearby trees.

To evaluate progress toward this goal, we need information about the types of tree/site combinations that result in high maintenance costs or damage. Tree inspections can be conducted to determine what types of tree/site combinations are associated with current maintenance and damage problems. Most or all of this information is available using campus tree inventories that track tree maintenance. Costs of hazardous tree removals, tree-related sidewalk repairs, and maintenance should be tallied by the types of tree species and planting situations where they are incurred. In the absence of good historical records, ground surveys can be conducted to determine what types of tree/site combinations are associated with current maintenance and damage problems. Once these relationships are established, they can be used as a basis to evaluate current tree selection, tree locating, and maintenance practices. The evaluation should be repeated periodically to account for changes that result as new species, planting methods, and hardscape designs are adopted, and as trees planted at different times mature.
• Maintain trees in a healthy condition through sound cultural practices.

A university is not likely to realize most of the benefits that the campus forest can provide if its trees are in poor health. Promoting tree health helps the University protect their investment in the campus forest. Public health and safety also depend on healthy trees. Improperly maintained and unhealthy trees often have an increased risk of breakage or failure, which can result in personal injury and property damage. Cultural practices have a major impact on the health of urban trees. Proper and timely pruning can promote good tree structure and health, whereas topping and other improper pruning techniques can result in hazardous structure and decay. Irrigation is necessary for tree survival in many situations, but excess or improper irrigation practices can contribute to the decline of established trees. By providing for proper tree care and eliminating destructive practices, universities can go a long way toward maintaining their campus forests in a healthy and safe condition.

Progress toward this goal is evaluated by assessing tree health over time through our tree inspections and our tree evaluations done jointly with the Office of the University Landscape Architect.

• Establish and maintain an optimal level of age and species diversity.

The trees that make up the campus forest have finite life spans and must be removed as they die. Living trees may also be removed when their health, appearance, or structural integrity decline substantially, or when they conflict excessively with utilities and structures. The likelihood that a tree will need to be removed for one reason or another increases as the tree grows older and larger. If areas are planted to a single species at one time, a large percentage of the trees will need to be removed over a short time period when they reach the end of their useful life. This results in a rapid reduction in canopy cover, and the loss of many of the benefits provided by the campus forest. This undesirable situation is less likely to occur if the campus forest is composed of a variety of tree age classes and species. Serious pest outbreaks and epidemics can arise in communities in which large areas are planted to a single susceptible species or variety. These outbreaks can seriously impair the overall health, appearance, and longevity of the campus forest. Species diversity and genetic diversity within species helps stabilize the campus forest by buffering it from pest and disease epidemics. Many insect pests and plant pathogens can only attack one or a few tree species. The reproduction and spread of many tree pests and diseases will be slowed if the university forest contains a diverse mix of tree species. Furthermore, if an especially virulent disease or pest problem does develop on a given species; species diversity ensures that the condition of the entire community forest is not jeopardized.
In order to evaluate progress toward this goal, we are using information on the
distribution of tree species and age classes within the campus forest. This
information is extracted from our Campus Tree Inventory.

**TREE DAMAGE ASSESSMENT**

The University of Michigan has detailed policies, guidelines, and procedures on both tree
preservation and tree protection. Details for making damage assessments are the
responsibility of the Grounds Department and in particular, the University Forester. The
methods for assessing damage to trees are consistent with the methods used by the
Council of Tree and Landscape Appraisers representing the International Society of
Arboriculture. Fines, penalties and appeals are documented in the Tree Preservation and
Tree Protection policy guidelines.

**COMMUNICATION STRATEGY**

The Campus Tree Plan is communicated through the various student, faculty, and staff
groups working with the Service Learning Opportunity groups around campus and
through the various media outlets on the University campus and the City of Ann Arbor.
The Campus Tree Management Plan will be available through the University of Michigan
Plant Operations website under [Grounds Services-Forestry](#) Campus Tree Management
Plan.

**DEFINITION OF TERMS RELATED TO CAMPUS TREES**

**Tree Pruning** – Tree pruning will include the removal of dead or broken branches. It
will also include the removal of crossing branches or branching patterns that currently or
may in the future affect the structure or aesthetic value of the tree.

**Tree Inspection** – Tree inspections will include the visual and physical inspection of
individual trees. Inspections will be used to identify existing or potential problems
including but not limited to insects and disease, rot, structural problems, construction
damage, growth, nutrient needs, and the overall health and value of the tree.

**Tree Insect and Disease Control** – Insect and disease control will include the
application of pesticides, fungicides, and others agents as determined by the University
Forester.

**Tree Watering and Fertilizing** – Watering and fertilizing will include the application or
water or fertilizers at rates needed to maintain the health and vigor of the tree.

**Tree Removal** – Removal of trees will include the branches and trunk. The removal of
the stump will be determined on a case by case basis.
Expenditures include:

- **Cost of Trees Purchased:** While the amount may varied due to budgetary stresses, The University of Michigan annually spends $50,000 on planting trees, the majority of this money is used to replace trees that have been removed, but there is also a portion used for installing trees into new landscapes. Of the $50,000, labor, equipment and supplies are accounted for by $30,000, the remaining $20,000 is used for purchasing the tree plant material.

- **Tree Maintenance (pruning, watering, fertilization, mulching, competition control, etc.) and Tree Removal:** The Grounds Department allocates a substantial amount annually for the maintenance of the campus forest. The Forestry Work Plan takes into account the tree health care needs of tree pruning, tree inspections, insect and disease management, watering and fertilizing, and tree removals. Forest maintenance is a part of the integrated maintenance plan for the entire University grounds. Please review the attached copy of the fiscal year 2012 Grounds Maintenance Work Plan. The Grounds Maintenance Work Plan divides the campus into zones and within those zones are maintenance priorities that determine the frequencies that particular maintenance tasks are completed. This same planning fundamental is utilized in the maintenance of the campus forest. Please review the attached example of a grounds maintenance zone map with the priority designations.

- **All Associated Costs of Campus Forestry Management including Public Education, Professional Development, Association Memberships, Tree Inventory, etc.:** The Forestry Crew at the University of Michigan are all certified arborists by the International Society of Arboriculture and fulfilled the requirement of earning a minimum of 30 continuing education units (CEU’s) over a three-year period to maintain their credentials. The Forestry Crew members are also certified Commercial Pesticide Applicators by the Michigan Department of Agriculture. The annual budgeted allotment for training to maintain these credentials is $500 and 40 training hours per year for each member of the Forestry Crew.

## ARBOR DAY OBSERVANCE

The University of Michigan as part of the greater Ann Arbor community has been and continues to be involved with annual Arbor Day celebrations.

The first of our Arbor Day observances occurred during the 2008 Campus Tree Tour on Thursday, November 13, 2008. The University sponsored its most recent annual tree-planting event on November 12, 2011.
An annual Arbor Day observance provides a wonderful opportunity for public education and outreach, and for enlightening the campus community as to the economic and environmental benefits of trees on campus property and in the community. It also provides an opportunity to promote the CFMP and its goals of canopy preservation, tree protection and sensible stewardship.

**SERVICE LEARNING OPPORTUNITY**

The University of Michigan Grounds Services Department provides numerous opportunities for engaging the student body through volunteer projects. Some of these opportunities include:

- *Volunteer Tree Plantings and Tree Maintenance:*
  Volunteers have worked at removing invasive plant species from several locations on Campus, most notably, through the North Campus Woodlot Conservation (NCWC) program where volunteers help to restore natural wooded areas by removing invasive species and clearing trails of encroaching and hazardous vegetation for improved recreational use.

- *Tree Inventory Data Collection and Update Functions:*
  Students have been and will continue to be instrumental in accumulating field data, entering data into the tree inventory database and in updating tree inventory data.

- Student-led effort to have community designated a Tree City USA.

- *Coordinate Internships with the Urban Forestry or Parks Department in Your Community.*

  Students are active participants within the UM Grounds Services Department throughout the year, working as student labor and occasionally, as interns on the Forestry Crew and the Turf Crew.
ADDENDUM 1

TREE PLANTING INSTRUCTIONS

By carefully following nine (9) simple steps, planting stress can be significantly reduced:

Dig a shallow, broad planting hole. Make the hole wide, as much as three times the diameter of the root ball but no deeper than the root ball. It is important to make the hole wide because the roots on the newly planted tree must push through surrounding soil in order to become established. On most planting sites in new developments, the existing soils have been compacted and are unsuitable for healthy root growth. Breaking up the soil in a large area around the tree provides newly emerging roots with room to expand into the looser soil, which hastens recovery and reduces transplant stress.

- Identify the trunk flare. The trunk flare is where the roots spread (buttress) at the base of the tree. This point should be entirely visible after the tree has been planted (see diagram below). If the trunk flare is not visible, you may have to remove some soil from the top of the root ball. Find the flare so you can determine how deep the hole needs to be for proper planting. Planting hole depth is measured from the base of the root ball to the base of trunk flare.

- Remove tree container for containerized trees. Carefully cutting down the sides of the container may make this easier. Inspect the root ball for circling roots and cut or remove them. Expose the trunk flare, if necessary.

- Place the tree at the proper depth. Before placing the tree in the hole, check to see that the hole has been dug to the proper depth and no more. The majority of the roots on the newly planted tree will develop in the top 12 inches of soil. If the tree is planted too deeply, new roots will have difficulty developing because of a lack of oxygen and impeded water infiltration. It is better to plant the tree a little high, such as an inch or two above the base of the trunk flare, than to plant it below the original grade. A slightly elevated planting level will allow for some settling (see diagram below). To avoid damage when setting the tree in the hole, always lift the tree by the root ball and never by the trunk.

- Straighten the tree in the hole. Before you begin backfilling, have someone view the tree from several directions to confirm that the tree is straight. Once you begin backfilling, it is difficult to reposition the tree.

- Fill the hole gently but firmly. Fill the hole about one-fourth full and gently but firmly pack the soil around the base of the root ball. Then, if the root ball is wrapped, cut and remove any fabric, plastic, string, and wire from around the trunk and root ball to facilitate growth (see diagram below). Be careful not to damage the trunk or roots in the process. Fill the remainder of the hole, taking care to firmly pack soil to eliminate air pockets that may cause roots to dry out. To avoid this problem, add the soil a few inches at a time and settle with water. Continue this process until the hole is filled and the tree is firmly planted. It is not recommended to apply fertilizer at the time of planting.

- Stake the tree, if necessary. If the tree is grown and dug properly at the nursery, staking for support will not be necessary in most landscape situations. However,
protective staking may be required on sites where lawn mower damage, vandalism, or windy conditions are concerns. Staking may also be required if the trunk of the tree is loose in the root ball. If staking is necessary for support, there are three methods to choose among: staking, guying, and ball stabilizing. One of the most common methods is staking. With this method, two stakes used in conjunction with a wide, flexible tie material (such as Arbor Tie) on the lower half of the tree will hold the tree upright, provide flexibility, and minimize injury to the trunk (see diagram below). Remove support staking and ties after the first year of growth.

- Mulch the base of the tree. Mulch is simply organic matter applied to the area at the base of the tree. It acts as a blanket to retain soil moisture. It also moderates soil temperature extremes, and it reduces competition from grass and weeds. Some good choices are leaf litter, pine straw, shredded bark, peat moss, or composted wood chips. A 2- to 4-inch layer is ideal. More than 4 inches may cause a problem with oxygen and moisture exchange. When placing mulch, be sure that the actual trunk of the tree is not covered. Doing so may cause decay of the living bark at the base of the tree. A mulch-free area, 1 to 2 inches wide at the base of the tree, is sufficient to avoid moist bark conditions and prevent decay. Avoid “volcano” mulching (where mulch is piled up against the tree trunk).

- Provide follow-up care. Keep the soil moist but not soaked; over-watering causes leaves to turn yellow or fall off. Apply water to trees at least once a week, barring rain, and more frequently during hot weather. When the soil is dry below the surface of the mulch, it is time to water. Continue until mid-fall, tapering off for lower temperatures that require less frequent watering.

Other follow-up care may include minor pruning of branches damaged during the planting process. Prune sparingly immediately after planting and wait to begin necessary corrective pruning until after a full season of growth in the new location.
TREE PLANTING DIAGRAM:

- Use two opposing, flexible ties—when staking is necessary. Ties should be placed on the lower half of the tree and allow trunk movement.
- Keep mulch 1 to 2 inches back from trunk.
- Gently pack backfill, using water to settle soil around the root ball.
- Set ball on firmly packed soil to prevent settling.
- Remove containers, wrappings, wires, and ties.
- 2- to 4-inch layer of mulch.

2011 version
ADDENDUM 2

TREE PRESERVATION POLICY *(draft)*

Purpose: To provide for the preservation of trees on all University of Michigan property.

The preservation of existing trees on any campus development is of the utmost importance. Many of the trees on campus are significant either due to their size or species, or because they have historic identity. Mature trees provide a number of aesthetic, ecological, economical and social benefits. Though large canopy trees may take 100 years or more to reach their full size, when a large tree is removed the impact is immediate and a part of the campus history is lost. The removal of small to mid size trees is not as dramatic; however, the impact on the future campus landscape is significant. When small to mid size trees are removed today we are eliminating the majestic large trees of the future. We enjoy the large trees on the campus today because of the preservation efforts of those who came before us. Therefore all projects shall seek to preserve prominent trees as a priority by seeking ways to reduce impacts to their canopy and root zones.

Preservation, rather than relocation/removal, will be the first priority in order to retain many of the significant trees on campus. If preservation of a particular tree or group of trees is not possible, then relocation would be the second option. If the tree size, location, or other factors do not allow for transplanting, then removal becomes the last and least desirable option.

When it is determined that existing trees are to be preserved, it becomes critical that they are protected throughout all phases of construction. Early in planning and pre-design phases, site trees will be evaluated and a plan for preservation, relocation or removal will be developed. Refer to the Tree Preservation Guidelines for detailed instructions.

No tree shall be removed from any campus location without the prior approval of the University Planner’s Office (UPO) and/or the University Forester (UF). Significant trees can only be removed with the approval of the Associate Vice President of Facilities Operations (AVPFO).

Funding for the removal and replacement of trees and/or the relocation of trees shall be provided by the related project. Replacement trees will reflect the individual or cumulative caliper of the trees removed. For example, two 5" caliper trees could be replaced with one 10" caliper tree or five 2" caliper trees. The replacement trees will be planted on the project site or elsewhere on campus as determined by the UF and UPO.

Exceptions to this policy or its related Tree Preservation Guidelines shall be reviewed by the UPO and approved by the AVPFO.

The Tree Preservation Guidelines and the Campus Tree Protection Procedures are incorporated herein by this reference and must be followed closely.
ADDENDUM 3

TREE PRESERVATION GUIDELINES (draft)

**General**
This guideline provides direction for design decisions and delineates requirements for campus trees impacted by construction activity on all University of Michigan (U-M) property. U-M policy provides for the preservation of campus trees. Preservation, rather than relocation/removal, will be the priority. If preservation of a particular tree is not possible, then relocation will be the second option. If the tree size, location or other factors make this infeasible, then removal with accompanying 1:1 replacement becomes the last option.

Trees located on campus are the property of the U-M and shall be treated as such. Campus trees shall not be used for posting. Stripping of topsoil within the tree protective zone shall be avoided. Impacts to memorial/commemorative and City trees shall be avoided. When this is not possible, coordinate with the University Planner’s Office (UPO). Memorial and commemorative trees may be planted on U-M property following established guidelines (see Memorial Tree Guidelines).

For undeveloped woodlots on campus, the Design Manager (DM) shall coordinate a site survey request during planning phase to include a survey of trees of 4” caliper or larger. This information shall be shared/coordinated with the University Forester (UF) to identify healthy trees which will then be evaluated for protection, removal or transplant. Standard survey requirements apply (see Standard Site Survey Request List).

Designers shall consider sustainable opportunities that reuse significant campus tree removals, such as reuse of wood within the project.

**Related Sections**
Campus Planning Topics and Guidelines (web access only)
- Tree Preservation Policy
- Memorial Tree Guidelines

Design Guidelines Technical Sections
- 02000 – Site Work
- 16521 – Outdoor Lighting

U-M Master Specifications – Architectural
- 01140 – Work restrictions – Tree protection
- 02930 – Landscape (02911 – topsoil, 02912 – landscape mulches)
- 02215 – SESC

U-M Standard Details
- Tree Protection

Other (See Project Manager)
- AEC Wide Project Management Guidelines – Standard Site Survey requests
- Tree evaluations/Tree preservation procedures/Tree rankings
**Protection**

Tree protection throughout construction is critical to maintaining our campus trees and to promoting campus environmental stewardship. Therefore, all projects shall seek to preserve prominent trees (rankings 1-3) as a priority by seeking ways to minimize impacts to all healthy trees and their respective root zones from design phase through to construction completion, before considering transplant or removal (see tree rankings documents for definition of rankings).

During the earliest design phase, the DM will coordinate the request for an updated site survey (see standard site survey request) for all projects with site impacts, if a current one is not available. Site surveys received shall locate all trees per standard survey request list requirements particularly showing tree locations, best accuracy of tree canopies, and display of tag numbers of existing trees located within the project site and surrounding areas of potential impact. A tree survey, combining the latest site survey with a tree evaluation done by the UF, will be requested by the PM as part of pre-design work for campus development projects from the UPO. The DM can forward a site survey and a request for tree evaluation completion assuming corrections to the survey are not needed.

Together the DM and the UF small meet to categorize the trees on the survey. This information in the form of the approved tree protection plan will be recorded and provided to the designer and the final copy sent to the UPO. The designer shall develop a building and site concept plan in accordance with the requirements shown on the tree protection plan. Deviation from the direction provided by the tree protection plan will not be permitted without prior approval from the UF. The UF shall be notified if there is a need for a change at any stage by the DM, Project Manager/Construction Manager (PM/CM), or contractor. The UPO shall also be updated regarding any changes.

The tree protective zone around each tree shall be outside of the canopy drip line. This protective zone for significant trees shall not be moved, removed or altered unless there is a compelling reason why this is needed. In such a situation, approval for the deviation must be obtained from the UF in advance of any work that will impact the trees. Violations are subject to penalties; refer to supplemental general conditions article 13a.

Designers shall plan for all site impacts, including utilities, to occur outside of the tree drip lines and into or along utility corridors (see site impacts checklist). The tree protective zone shall be clearly identified on all relevant contract documents and in the field. The methods of tree protection will be determined by existing University specifications or by the UF in special cases. The installation of tree protection will be the responsibility of the contractor.

Every effort shall be made to reduce encroachment within tree drip lines, impacts on woodlot water tables, as well as compaction of soil, soil contamination, and mechanical injury to roots, trunks or branches, thereby degrading root function and inhibiting the development of new roots.

Impacts by either raising or lowering the perched or permanent water table of nearby trees shall be avoided when possible and discussed with the UPO/UF when impacts are
Designers shall coordinate the evaluation of the water level via geotechnical study and have them reviewed in the earliest phase of design by a forest ecologist or equivalent specialist. Designers shall assure proposed grades will not bury, suffocate, or expose tree roots within drip lines of trees to remain or to be protected. Grades shall allow for the natural flow of water and avoid ponding near the base of the tree. Every effort shall be made to keep trees on slopes greater than 8% to maintain soil stabilization and minimize removal of trees or soil nearby.

Designers shall avoid design impacts on trees, including but not limited to, excavation, shoring for buildings, depths of construction for walks and other pavement types, boom swings for large equipment, and grading within prominent tree drip lines within construction fencing and in areas of impact nearby related to the project. Design alternatives to avoid root damage shall be considered including bridging, air spading, etc.

When impacts within drip lines cannot be avoided, they shall be reviewed with the UF. Directional boring should be used as a priority over open trenching within tree protective zones. Minimum depth for boring within protective zones shall be 2’ to avoid root structures and 3’ for open pits outside of drip lines. Designers shall budget and design accordingly. Trenching within drip lines shall be cut by hand, air spade, or utilizing other hydraulic or pneumatic air excavation technology. Areas disturbed within protective zones shall be backfilled immediately and soaked the same day.

Designers shall guide alternate pedestrian/traffic routes during construction logistics planning to occur outside of tree protective zones when routes through the landscape are warranted. When this is unavoidable, 4”-6” mulch paths or rings should be installed, leaving the trunk clear of mulch, to reduce soil compaction and allow for air and water infiltration.

As necessary, designers shall consult with the UPO and the UF after consulting with the DM for further clarification of tree evaluation and prominent trees on campus. Questions regarding site impacts shall be directed to the UPO.

Designers shall provide within the project budget for the cost of tree remediation efforts during site preparation, construction and post construction activities. Designers shall make provisions for gator bags for existing and new trees when irrigation is unavailable, particularly during the hotter months of the year such as July/August.

Transplant
When protection of campus trees is not possible, designers shall transplant trees smaller than 6-8” caliper (measured at diameter at breast height or DBH) as a standard and consider transplanting prominent trees planned for removal of 8” DBH or greater. Designers shall coordinate with the UF and the DM to verify costs versus benefits of transplants of prominent trees greater than 8” DBH. New locations for transplants will be coordinated with the UPO when on-site project limits have been exhausted. New trees and transplants shall not be installed within easements or City right-of-ways (ROW) without prior approval from the UPO. Since tree evaluations from the UF will include
estimated costs for relocating, removal and/or replacement, the designers shall plan for these costs to be covered in the project budget when the efforts are not included in the general contractor’s scope of work. Affected trees shall be properly noted on all relevant drawings.

**Removal/Replacement**

When protection or transplant of campus trees is not possible, removal shall be considered. The decision to remove a significant tree can only be made by the Associate Vice President for Facilities and Operations (AVPFO). If during design, it is determined that significant trees or memorial trees are to be relocated or removed, a request form shall be submitted, accompanied by a written summary and a survey prepared by the DM, the UF and the UPO describing the significance of these trees and the reasons for relocation and/or removal to be submitted to the AVPFO for approval.

Removal includes cutting the tree down and debris disposal. When the project is not able to protect City trees, the designer, via the DM, shall coordinate with the UPO for alternate design considerations. The PM/CM shall then coordinate removals with the UF. Designer shall consider alternatives to designs to avoid removals or prominent trees rank 1-3. Avoiding removal of significant trees will minimize the need for replacements.

In order to maintain the campus forest, significant trees to be removed will be replaced in kind by the project responsible for removal. Landscape plans shall account for all replacement trees at a minimum. Consult with the UF or the UPO for a list of trees to avoid. Per the Tree Preservation Policy, replacements per caliper inch are required for the removals of significant trees ranked 1 and 2. Replacements shall also be included for trees ranked 3 when budget permits to assist in maintaining overall campus canopy. Tree replacements shall equal the individual or cumulative caliper of trees removed. For example, two 5” caliper trees could be replaced with one 10” caliper tree or five 2” caliper trees.

Designers shall accommodate replacement trees on the project site first, then elsewhere on campus as determined by the UPO. The UPO, in conjunction with the UF, will assist in siting new or transplanted trees when the project site is not able to accommodate them. It is the DM’s responsibility to assure tree replacement funds are included within the project budget. Consult the UPO/UF for tree evaluation and guidance.

**Construction Documentation**

Projects with tree impacts shall have a tree inventory included in plans showing tag number, species name, size and status (protect, transplant or remove). Designers shall include U-M standard tree symbols on all relevant sheets that have site and tree impacts. This information should be included in the legend on applicable sheets. Construction documents shall include tree survey information showing all memorials, City and U-M trees to remain protected, transplanted or removed, on all relevant construction documents. These documents shall also include information in the previously mentioned categories for those trees located outside of project construction limit line/scope areas that could have impacts. Relevant documents include but are not limited to existing
conditions plan, demolition plan, proposed site plan, excavation/shoring, grading, lay
down/staging, utilities, site lighting studies, AV, site work and SESC plans.

Designers shall represent existing trees to remain differently from proposed new trees,
either by shading or center plus sign and dot on all applicable construction documents,
including symbols in a legend on each sheet. Designers shall not show trees removed on
proposed work plans.

Construction documents shall include the following notes as appropriate:

- Contractors shall take precautions to avoid damage to tree trunk, crown, root, and
  root compaction. Removals shall take care to avoid root damage to nearby trees
  that will remain.
- Contractors shall not remove trees unmarked on plans for removal without the
  approval of the UF.
- Contractor shall not allow activity, including parking, driving of vehicles,
  pedestrian routing, staging, lay down, material storage, bury pits or concrete
  washouts within the tree protective zones.
- Tree protection shall consist of chain link fencing with posts clearly marking
  protective zone around each tree or grouping of trees per U-M Standard Tree
  Protection Detail within construction limits.
- Protective fencing shall be installed prior to the start of any site work per
  locations as approved by the UF and maintained throughout construction unless
  otherwise approved by the UF. If encroachment within protected areas is needed,
  the UF shall be informed immediately.
- Access to trees on construction sites shall be provided at all times for treatment
  such as aeration, gator bags or other remediation measures as needed during
  construction.
- Contractor removing trees shall removed felled trees and all associated debris
  immediately.
- Trees unmarked on plans should be assumed for tree protection unless otherwise
determined by the UF or the Tree Protection Plan.

It is not the intent of this guideline to dictate project design or constructability. Conflicts
with other design guidelines shall require consultation with the Design Manager (DM) or
Project Manager (PM) for design and/or construction as appropriate, and the University
Forester (UF) to resolve. Questions should be directed to the University Planner’s Office
(UPO).
ADDENDUM 4

TREE PRESERVATION PROCEDURES (draft)

INTRODUCTION
This document describes the tree protection, removal, transplant and replacement procedures for University of Michigan (U-M) Design and Project Managers for the Ann Arbor Campuses.

PRE DESIGN PHASE
1. Site Survey – During earliest phase of design, the Design Manager (DM) shall request an updated site survey for all projects with site impacts, if a current one is not available.
   a. Survey must follow requirements listed within the U-M standard site survey request list.
   b. University Planner’s Office (UPO) and University Forester (UF) can be resources for tree information if tag numbers are provided.
2. Survey Review
   a. Surveys received will be reviewed for compliance to survey request list and GIS.
   b. UPO shall update tree locations in GIS and forward to UF to field verify tree locations, tag numbers and estimated canopies.
   c. Discrepancies will be shared with DM for updating. When corrected, the DM shall forward to the designer with a copy to the UPO/FIC. UPO shall document proposed project tree impacts.
3. Tree Evaluation Request – DM shall request a tree evaluation during the earliest phase of design from the UPO – estimate 3-4 weeks (includes survey review).
   a. DM will provide UPO with site description or plan of proposed area of impact.
   b. UPO will provide Memorial and City tree information.
   c. UPO will provide base map for UF to perform tree evaluation.
   d. UF will review and approve tree survey (site survey + tree evaluation) and send to DM displaying locations of all trees, tag numbers, estimated canopy, and rankings to guide design (copy to UPO). Respective evaluation/report will include species name, potential for transplant, transplant cost and replacement cost.
   e. UPO will update system and provide updated reports and maps for UF as final tree survey.
   f. UF will forward approved final tree survey to DM.
4. Tree Protection Plan (tree survey)
   a. Early in design phase, UF and DM shall discuss trees to remain protected, transplanted or removed.
   b. UPO will update system, project related removals/replacements and communicate requirements accordingly.
SITE CONCEPT PHASE
1. The DM shall develop a building and site concept in accordance with the requirements shown in the on the Tree Protection Plan.
2. For areas with potential tree impacts, the DM and UF shall categorize the trees on the survey as follows:
   i. Trees to remain and be protected through construction
   ii. Trees that can be relocated/transplanted (of any rank)
   iii. Trees that can be removed (of any rank)
   iv. Trees ranked 3 that shall be designated for protection but shall not limit construction
   v. Memorial/commemorative trees (including tree tag number) and their associated plaques
   vi. Trees located within the right-of-way
   vii. Areas of protection or groups of trees to be protected
3. UPO shall develop a Tree Protection Plan which will document trees planned for removal, transplant, or to be protected during construction.
4. Replacement requirements will be determined and shared with DM. DM will be responsible for replacement trees to be located on site and funded. For trees that cannot fit on site, alternative sites or transfer of funds shall be proposed by the UPO.
5. DM shall coordinate AVPFO approval for removal of significant and memorial trees.

DESIGN PHASE
1. Designs shall be reviewed by the UF and UPO for compliance to approved tree protection plan and U-M standards. UF shall review and approve changes to Tree Protection Plan. UPO shall note changes to Tree Protection Plan and update counts accordingly.
2. DM shall discuss deviations from the Tree Protection Plan with UF immediately and copy UPO.
3. DM shall notify UF/AVPFO/UPO for additional removals of significant trees. Project Manager/Construction Manager (PM/CM) shall budget for tree protection, transplants and replacement requirements. This amount shall be considered an estimate until the final costs are determined during construction phase. DM shall include contingency if PM/CM has not been consulted for impacts to significant trees.
4. DM shall coordinate with UPO to determine new locations for transplants.
5. UPO shall communicate tree replacement requirements periodically or as necessary during design phases.
6. PM/CM shall be consulted during design phase for a more accurate review of tree impacts from equipment, routing, staging, etc.

CONSTRUCTION PHASE
1. During the construction kick-off meeting, DM, PM/CM and UF shall review tree protection, verify tree removals and transplants and discuss site logistics regarding impacts to landscape (staging/lay down/haul road impacts, etc.).
2. PM/CM is responsible for ensuring funds remain available for pre-construction tree efforts.
3. PM/CM is responsible for enforcing tree protection during construction. UF will periodically review and consult with PM/CM and contractor as needed.
4. PM/CM shall ensure that no tree shall be removed without the approval of the UF and that trees unmarked on plans shall be assumed protected. Should additional removals beyond tree protection plan be necessary, UF shall be contacted immediately.
5. PM/CM shall coordinate transplants with UF allowing at least 2 weeks’ notice or as early as possible.

POST CONSTRUCTION PHASE
1. UPO in conjunction with UF shall perform post construction review to update counts and maps.
2. UPO shall communicate final counts to PM/CM and suggest funds be transferred into tree bank when replacements cannot fit within the bounds of the project site or elsewhere on Campus.
3. UPO and UF shall coordinate to update central records to reflect new trees.
## Zone Two Maintenance Estimating Worksheet

**Work Order 386637 General Fund - Summery and Staffing Needs**

### Total Labor Hours Needed by Month for Each Maintenance Category

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**Total** 1600 | 1386 | 1528 | 1378 | 1384 | 1284 | 1207 | 1458 | 1188 | 916 | 1266 | 1435 | 1371 | 16015.5

### Total Cost by Month for Each Maintenance Category

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**Total** $64,934 | $52,658 | $63,032 | $58,602 | $59,017 | $66,217 | $75,951 | $64,069 | $53,380 | $58,187 | $51,938 | $52,275 | $720,259

### Estimated Staff Needed by Month for Each Maintenance Categories

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**Total** 10.7 | 11.4 | 10.2 | 11.4 | 10.7 | 10 | 9.8 | 9.9 | 7.5 | 8.4 | 11.9 | 11.4 |