Michigan State University Campus Tree Management Plan

Effective March 19, 2020

MICHIGAN STATE
UNIVERSITY

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Michigan State University Campus Tree Management Plan
East Lansing, MI

Introduction

The campus of Michigan State University (MSU) is an outdoor living laboratory for the planting and study of trees from its establishment in 1855. Tens of thousands of trees representing the great diversity of species hardy in central Michigan have been planted on the campus next to native trees that have been growing on the land that would become the MSU campus for over 200 years. The oldest known living tree on campus was dated to have germinated over 375 years ago. The first commemorative tree was planted in 1863 by then university President Abbot celebrating the birth of his daughter. The second commemorative tree was planted in 1865 to commemorate the birth of President Abbot's son. A commemorative tree planting program has been maintained ever since. The earliest Arbor Day planting on the MSU campus dates to the planting of a white oak (*Quercus alba*) by the Delta Tau Delta Fraternity in the 1890's. The tradition of planting a tree to commemorate Arbor Day continues to be celebrated to this day (Appendix 2). An official arboretum was established on the campus in 1874 by Professor William James Beal to study how to grow trees, tree growth and to educate farmers across the state on the value of growing trees on land that was less productive for growing crops. This is the birthplace of Michigan Forestry and started the campus-wide tradition of placing interpretive labels on selected trees for use by students and faculty at the university and by the public who visit campus. Today, the arboretum covers the entire 2000+ acres of the developed campus. MSU is committed to the growing and care of its trees from the nursery to removal. Trees are grown in the on-campus Beaumont Nursery, planted, maintained and removed by MSU Landscape Services staff and the wood is repurposed in conjunction with the MSU Forestry Department as part of the MSU Shadows Program.

1. Purpose

The purpose of Michigan State University's Campus Tree Management Plan is to document the methods and requirements to maintain a healthy urban forest and to protect and preserve our campus trees for students, faculty, and people from the community to study and enjoy. The protection and maintenance of our trees is crucial to support the University's teaching/learning, research, and outreach mission.

Plan objectives:

- Maintain and protect campus trees and woodlots by minimizing and mitigating the impact of construction, event activities, and damage as a result of exotic insects and diseases.
- Continue to promote age and species diversity through the wide use of native and non-invasive trees where appropriate.
- Ensure that all trees requiring removal due to mortality, injury, or construction are replaced in a timely and consistent manner in accordance to the MSU Campus Tree Replacement Policy (*Appendix 7, pages 23-24*).
- 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.
- 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.

2. Responsible Authority

The Director of W.J. Beal Botanic Garden and Campus Arboretum and the Campus Arborist are the parties responsible for enforcing the Campus Tree Maintenance Plan. The Campus Arborist supervises the arborist crew who are responsible for pruning, maintenance, and tree removals.

3. Campus Tree Advisory Committee

The MSU Tree Management Committee meets quarterly, providing guidance and input on management plan components, including tree planting, maintenance, and removal procedures. They also provide outreach and education to the community and University 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.

Composition of the MSU Tree Management Committee:

Director of the W.J. Beal Botanic Garden and Campus Arboretum
Campus Arborist
MSU Landscape Architect
Faculty Member (Department of Forestry)
Student Representative
Community Representative

4. Campus Tree Maintenance Policies and Procedures

The Campus Arboretum
The Campus Arboretum encompasses the entire 2000+ acres of the developed campus of MSU which contains over 20,000 trees. A comprehensive inventory of campus trees was conducted beginning in 1990, the data for each individual tree is maintained in a campus-wide accession database, BGBASE®, and the location of each tree is managed in a joint AutoCAD/Arcview GIS mapping system. Tree care data including, but not limited to propagation notes, planting date, relocation date, periodic phenological records on select trees, tree condition (health), treatments, pruning, periodic evaluation, tree diameter, height and crown spread, and removal date and reason for removal are maintained for each tree. A Plant Recorder assists the Director, Arborist, and Curator in maintaining and updating the plant records. An inventory of woody shrubs is currently being conducted. New acquisitions and introductions to the Campus Arboretum enter campus via the Beaumont Nursery. This includes propagation of new trees from seed or cuttings, and acquisition of new trees and shrubs from other arboreta and from commercial nurseries. Trees are grown up to the appropriate size before installation on the campus. A team of Landscape Architects work with the Nursery Manager and Director to maintain and increase plant diversity and are responsible for planting design plans for all campus

plantings. The Site Crew within Landscape Services is responsible for the installation and subsequent watering of new plantings for a minimum period of two years after planting. The Arborist Crew is responsible for all additional plant health care maintenance as outlined below.

Plant Health Care Maintenance
Damaging levels of insects and diseases are addressed with an integrated pest management strategy to minimize risk to environmental and human health. Proactive cultural methods to promote overall health are emphasized to mitigate damage caused by pests and diseases. MSU's W.J. Beal Botanical Garden and Campus Arboretum is a co-founding institutional member of the American Public Gardens Association's (APGA) Sentinel Plant Network (SPN) jointly supported by the USDA APHIS. The garden program provides periodic training for MSU employees, volunteers and local institutions to increase awareness and to recognize emerging new diseases and insect pests and introduce them to procedures of how to report any occurrences which may appear in our region.

Dutch elm disease, gypsy moth, oak wilt, two-lined chestnut borer, Diplodia blight, scale insects, emerald ash borer, and bronze birch borer require special attention and treatment as an ongoing program. Trunk injections of control products are used as the primary delivery method lessening the environmental impact. Inspection prior to treatment is used to confirm the pest has reached the action threshold.

Regular inspections throughout the growing season are performed by 7 full time arborists and approximately 60 full time team members in Landscape Services. A tree inventory database (BG Base) and mapping application (ArcGIS) is available to all team members. All trees and shrubs are documented through GPS, along with health & measurement data. Routine and emergency requests for maintenance can be uploaded to ArcGIS Collector by any team member in the field by handheld mobile device.

An Air spade tool is used on trees that require root crown excavation, removal of girdling roots, inspection of below ground root system, or to assist in the preservation process during construction activities. In 2017 the arborists performed approximately 742 root crown excavations.

Soil amendments are performed only on trees after they have been diagnosed for a specific problem. Slow release nitrogen, compost, and sulfur are some of the more common materials used.

Pruning Maintenance
All tree pruning adheres to ANSI A300 Standard Practices-Pruning. Trees are routinely inspected by the campus arborists and data is (notes, photos, maintenance tasks) entered into the ArcGIS Collector. The work is then spatially referenced and accessible to the arborist crew. Based on the number and size of limbs to be removed, the work is classified as a fine, medium, or coarse prune.

Our initiative to address structural issues, as it relates to habit and branch growth, involves subordinate pruning codominant leaders and limbs with weak branch attachment. Improved structure reduces risk of limb and stem failure, frequency of pruning needs, and excessive cut size on parent branches.

Planting & Landscaping
Campus tree plantings are based on ANSI A300 Best Management Practices-Planting. Trees are ideally planted in the dormant season following leaf drop or before leaf bud break. Planted trees are either purchased or grown at our campus nursery and can range from 2-8" caliper inches. The species selection and location are primarily determined by campus landscape architects, in conjunction with other team

members. Best planting practices are considered to provide ample beds, scarifying soil, etc. Recently planted trees are maintained and watered for two years following planting.

Special circumstances have required select trees to be relocated bare root using the air spade tool. One specimen was over 25 feet tall and still thriving 5 years after transplant.

Nursery Statistics:

Number of trees grown annually: 400+
Number of trees planted: 300
Propagating unique varieties: 373 species in production
Size when moved to campus: 2-8" caliper

See Appendix 1 for tree planting diagram and Planting vs Removal chart.

Sustainability

MSU strives for sustainable practices in its tree care, including the following examples:

- MSU Shadows Collection: Removed trees from campus due to decline, storm-damage, or construction are repurposed into lumber via the MSU Shadows program. This is a joint program in coordination with MSU's Forestry Department to train students in urban wood repurposing and to generate funds to support this self-sustaining program, including student internships and the acquisition and planting of new trees on campus. The program generates lumber which is distributed to local artisans who produce a variety of handmade collectibles which are sold to the public via MSU Surplus and Recycling. This program fosters the concept of sustainability by reducing the waste stream and providing for long-term sequestering of carbon in useful wood products. Profits go towards planting new trees on campus, student internships and to further develop academic programs in urban forestry.
- All woody debris is stored and reprocessed as mulch to be reused on campus.
- Reduced pesticide use through cultural practices and integrated pest management.
- Installation of porous pavement sidewalks, which uses recycled tires, for a semipermeable surface to improve drainage and aerobic conditions.
- Recent hammock post installations have been successful at deterring use of trees.
- Sidewalk Root Sulfur Analysis Project was done to research opportunities on how to mitigate tree root injury and sidewalk damage.
- MSU considers the removal and management of invasive species as part of its sustainability program. See under Tree Removals section below.

For additional information regarding tree maintenance see appendix 3.

"MSU SHADOWS"

Photo credit: J. Paul Swartz

Tree Removals

The final decision to remove a tree is the responsibility of the Director of the W.J. Beal Botanic Garden and Campus Arboretum and the Campus Arborist. A variety of factors are considered before a tree is ultimately removed, including, but not limited to condition, location, species, historical significance, hazard, environmental impact and rarity. When possible, risk reduction, rather than removal, is preferable. However, safety of the public is the highest priority. Relocation of trees is favored when survivability and logistics allow. In cases of historic and/or rare taxa (such as species on the IUCN Red List of Threatened Species or heirloom varieties) are threatened by removal, a decision is made to propagate the individual to maintain historic context or species diversity within the collection. There are several prohibited species no longer allowed to be planted on campus, these include invasive members of the following taxa: buckthorn (*Rhamnus*), tree of heaven (*Ailanthus*), Honeysuckle (*Lonicera*), multiflora rose (*Rosa multiflora*) and other invasive species.

Removal of prohibited species is determined on a case by case basis according to factors listed above and appropriate site restoration after removal.

Catastrophic Events

Damage to campus trees because of severe weather events (wind, ice, and snow) can be minimized by routine evaluation and maintenance. Subordinate pruning codominant stems and limbs with weak attachment will reduce the risk of failure when exposed to excessive forces. Tree evaluation from nursery stock, to select those with the best structural characteristics, contributes to a better growth habit. During and after periods of extreme weather events, the Campus Arborist and arborist crew in

conjunction with the Director of the W.J. Beal Botanic Garden and Campus Arboretum inspect areas of high-volume traffic: sidewalks, roadways, intersections, and building entrances. Initial action is to secure the hazard by removing the vulnerable portions of the tree. Repairing wounds and maintenance unrelated to mitigating risk are postponed until all high priority activities have been completed and weather conditions are safe for the arborist crew.

5. Tree Protection and Preservation Procedures

Tree protection fencing is used to protect trees from compaction and damage in or near construction sites or areas where the tree root zone is vulnerable to damage. PVC Fencing is installed around the tree's critical root zone by the arborist crew. The PVC fencing has shown to be more successful in deterring construction from entering the root zone versus orange fencing, or post and ropes.

Tree protection training is required for all contractors or persons who will be working near trees on campus. This training is to ensure individuals are made aware of practices that can be harmful to trees, the importance and history of trees to the arboretum, the expectation we have in terms of following protection policies, and the fines that can be enforced if a tree is damaged during construction activity. In the past 10 years over one thousand people have attended these classes.

See Appendix 2 for more information on tree preservation in construction areas and a photo.

6. Tree Replacement Procedure

Funding
Funding sources for the planting of new trees to replace trees removed from MSU-owned property include the Special Camps Tree Replacement fund, Campus Beautification fund, MSU Giving donor accounts, Campus Arboretum funding, and internal MSU IPF Landscape Services accounts.

Process
The process for new locations for tree plantings will be determine using the Collector App, recommendations from campus arborists and curators, the Plant Replacement List for out-of-warranty trees, tree removal mapping, and IPF employee recommendations. All trees used for tree replacement will be from the Beaumont Nursery Tree Inventory or approved vendors solicited from Beaumont Nursery staff.

Weekly meetings with an IPF landscape architect and IPF Landscape Services (LS) construction coordinator will be completed all year to determine, at a minimum, one location for tree installations on campus per week.

A. Once location(s) is determined:
    1. Use the GIS Utility app in the field to verify potential utility locations.
    2. A Landscape architect to identify exact tree location and type using BMN Inventory sheet.
    3. LS staff member to flag and paint location.
    4. LS staff member to input Miss Dig to verify utility locations.
B. Follow-up
    1. A Landscape architect adds tree to the Capital Projects Plant List.

2. The Construction coordinator adds to the weekly Capital Projects review meeting agenda to coordinate installation.

C. Post-Installation
   1. A Beaumont Nursery Technician fills out the pick-up sheet and sends to the Beal Gardens Botanical Technologist/plant recorder.
   2. The install crew adds tree(s) to the Watering Crew App for warranty watering.
   3. The Beal Gardens Botanical Technologist/plant recorder will GPS tree locations and verify BG Base is updated.

At the beginning of each weekly meeting, staff will re-visit the prior week's location to verify safe placement in conjunction with utilities.

Accountability-Reporting
MSU IPF Landscape Services Department will provide a report annually in December sharing the data from the above process.

See Appendix 7 starting on page 24 for the MSU Tree Replacement Policy.

7. Plan Goals and Targets

- Maintain maintenance cycle of five (5) years for all trees within landscaped areas on campus.
- Negotiate an event parking plan with the MSU Police Department that protects trees from soil compaction and root injury.
- Maintain a planting ratio higher than the annual removals to promote age diversity and increase our canopy percentage, as specified in the MSU Tree Replacement Policy *(Appendix 7)*.
- Perform root crown excavations upon trees, as needed, to promote overall health and vigor.
- Improve and update ArcGIS and the Collector tree inventory app, to better manage campus arboretum.
- Support tree research projects with the academic community to benefit the urban forestry industry.

8. Tree Damage Assessment

Tree damage is assessed by the arborist team, proper care is determined with the standards recommended by the International Society of Arboriculture (ISA). Significant damage to campus trees, by contractors or other liable parties, will be charged with a fine according to the established tree value guide.

See appendix 4 for more information on general protection as well as damage assessment tables.

9. Prohibited Practices

All plants on campus including campus trees are protected under MSU Ordinances (*see Appendix 6*):

24.00 Plant Materials
24.001 Injury or removal
24.02 Plant samples for teaching and research

Individuals requiring access to plant material from the garden or Campus Arboretum in support of teaching, research, or outreach activities may apply for a "Collecting Permit" which is issued by the Director of the W.J. Beal Botanic Garden and Campus Arboretum.

Several prohibited activities have been established to protect the overall health of trees on campus, these include:

- Parking on the root zone is discouraged due to the compaction of the soil from vehicles repeatedly driving and parking on the root system of valuable campus trees. *
- Locking bicycles, mopeds, scooters, or other objects to trees: due to repeated use, particularly on young trees with thin bark, mechanical injury of the cambium layer is unavoidable.
- Attaching in any fashion (including tying, nailing, screwing, or stapling) any posters, signs or other objects to trees in addition to hammocks, slacklines, bicycles or other objects is prohibited. This may cause cambium damage which may result in decline or death of the tree. Only approved interpretive or commemorative labels may be attached to campus trees under the direction of the Director of the W.J. Beal Botanic Garden and Campus Arboretum.

**See appendix 5 for information regarding vehicle use off roadways*

10. Definitions

DBH: acronym for tree Diameter at Breast Height. Measured at 1.4 meters (4.5 feet) above ground in the United States.

Cambium Layer: thin layer(s) of meristematic cells that give rise (outward) to the phloem and (inward) to the xylem, increasing stem and root diameter.

Drip line: imaginary line defined by the branch spread of a single plant or group of plants

Root Zone: horizon or layer within the soil profile where roots exist (often extends horizontally 1-1.5x the height of the tree).

ArcGIS Collector: Open source mobile software for tree inventory on a GIS map layer.

Soil Compaction: The increased bulk density of the soil resulting from mechanical forces to the soil surface thereby reducing air pore space and water holding capacity.

Root Crown: The portion of the lower stem of a tree where the flare of roots merge with the main stem of the tree.

11. Communication Strategy

The Campus Tree Management Plan will be available to the campus community and public on the MSU Landscape Service's website and offered during community outreach programs.

Campus trees have been promoted through various events such as Grandparents University and Alumni University. These are annual events where alumni and their grandchildren can attend various classes from all different fields of education. Both the Director of the W.J. Beal Botanic Garden and Campus Arboretum and the Campus Arborist present public Campus Tree Tours which focuses on the history and significance of the many notable trees within the MSU Campus Arboretum.

Both the Director of the W.J. Beal Botanic Garden and Campus Arboretum and the Campus Arborist are invited speakers at local, regional and national conferences hosted by the International Arboriculture Society where they present aspects of and promote the campus tree management plan as it relates to other organizations and institutions.

For additional information, contact the Director of the W.J. Beal Botanic Garden and Campus Arboretum.

Appendix 1

DECIDUOUS TREE PLANTING OVER 4" CALIPER

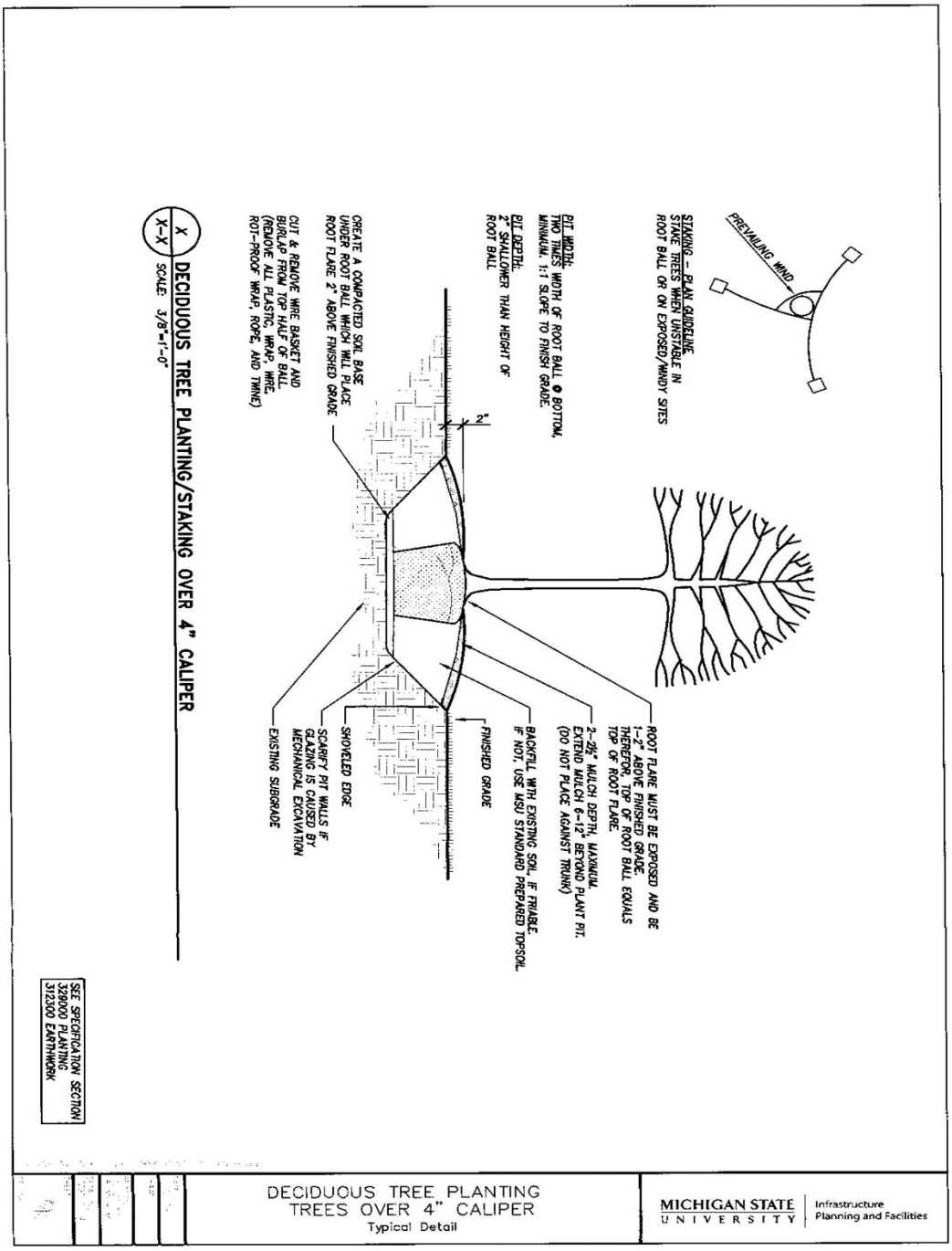

Photo credit: J. Paul Swartz

Appendix 2

TREE PRESERVATION IN CONSTRUCTION AREAS

Photo credit: J. Paul Swartz

Photo credit: J. Paul Swartz

TREE PRESERVATION IN CONSTRUCTION AREAS (Continued)

Trees are valuable living resources that require our efforts to preserve them during and after construction. Trees increase property values, decrease heating and cooling costs, benefit wildlife and enhance our lives in countless ways. Whether we are building, remodeling, installing utilities, or constructing roads we must take into consideration the tree's requirements to remain alive and healthy. We cannot replace a monarch in our lifetime or our children's lifetime.

The consequences of not protecting trees will result in their death or decline over a period of years. The expense of removing and replanting the trees justifies the initial cost of providing protection and care during construction. A large tree removal could cost thousands of dollars, while a fraction of that may have preserved it. Protecting trees can be accomplished in ways that will not slow the construction process. The results of our efforts will be healthy trees that will provide invaluable benefits and beauty for years to come. Tree Protection, in construction areas, is being done with excellent results at Michigan State University's campus and in other parts of the country.

Why trees are harmed or killed during construction:

1. 90-95% of tree roots are within the upper 24 inches of soil. They extend horizontally beyond one and a half times the height of the tree. This area is known as the ROOT ZONE. If the soils in the root zone are driven over by construction equipment or vehicles, COMPACTION occurs. This compaction eliminates air spaces, reduces root growth and increases drought stress. (Driving over an area seven times with a tractor will compact the soil equal to concrete). Trees need oxygen for their roots to survive. Driving or piling dirt over the root system (changing the grade) eliminates this oxygen and will slowly suffocate the tree. Because trees can live on stored food reserves, it sometimes takes up to five years before the tree dies. Soil compaction cannot easily be remedied. Prevention is the best and the most important thing you can do for your trees.
2. Roots support the tree structurally while providing water and nutrients to the leaves for growth. Cutting roots while trenching or excavation may result in death or die back to parts of the crown. These wounds can also be entry points for decay fungi. This can result in death or failure of the tree in high winds or storms creating an extreme liability in the future. It is highly important to protect the root system even though it is unseen.
3. Breakage or cutting of branches in the crown should also be avoided. When too much of the crown is removed, the tree cannot produce enough food for future growth. In this weakened state, it also becomes more susceptible to disease and insects. If pruning must be done, a professional arborist should be called. Damaging the bark on the trunk disrupts nutrient flow and provides an opening for decay fungi.

What can you do to protect trees before and during construction?

Before construction begins, the site should have a thorough inspection by a professional arborist to determine which trees are worth saving. The meeting should also include the general contractor and property owner. Tree species have different characteristics that will determine their value and ability to survive in the post construction environment.

Valuable trees should be identified early so construction methods and appropriate levels of protection can be determined.

Methods of tree preservation during construction:

1. PROTECTIVE FENCING: The "Root Zone" (one and a half times the height of the tree) should be protected from compaction by fencing this area around the tree.
2. The "DRIP LINE" (the area from the trunk to the branch tips) should be fenced if space does not allow the entire root zone to be protected. If the area inside the drip line must be disturbed, an Arborist should be consulted to determine the impact to the tree, consider alternative construction methods, and provide remedial treatments. The amount of soil area the tree requires to survive is determined by the age, health and species. The minimum, "Protective fencing" should consist of ropes and signs, orange construction or snow fences. A better option would be a metal chain link or wire farm fence. The best for long term projects and heavily used sites is wood or vinyl 4x4 posts with 2x6 cross pieces positioned horizontally at four and eight feet. If numerous subcontractors are working on the project, there is more opportunity for mistakes and damage to occur. Therefore, consider using the more substantial tree protection. Educating all the workers on the property is very important. Once people are informed and understand the reasons trees need our protection, they generally will become cooperative partners in protecting the trees. A clause in the construction contract may require restitution or fines if trees are negligently damaged.
3. Wood Chips (mulch) with a minimum depth of four inches should be placed under all trees before construction begins. Start a foot from the trunk and extend to the dripline, if possible. This will help prevent compaction should a vehicle violate the protective fence. It becomes an additional layer of protection for the root system. Wood chips can be left in place after construction. They provide moisture conservation for the trees along with many other benefits.
4. Roads and driveways should be located as far from trees as possible. If a temporary drive is needed in the root zone, use up to twelve inches of wood chips as base for the equipment to drive on. Research has found plywood does not provide adequate protection against compaction.
5. Directional boring machines should be considered instead of trenching to install gas and electrical lines. These machines can bore under trees and roads hundreds of feet. Their expense may be offset by the minimal damage to trees and structures. There are increasing numbers of contractors using this method for installing utilities. Combine utilities in one trench instead of two or more. Trenching or digging in the root zone of a tree, should be avoided.
6. Monitor the water and fertilization needs of the trees during and after construction.

Thousands of trees are destroyed needlessly every day during construction. By following some of these simple steps, you can save your customers thousands of dollars and help preserve the trees for years to come.

Author: J. Paul Swartz, Michigan State University Campus Arborist

Appendix 3

TREE MAINTENANCE

Michigan State University's main campus sets on 2,000+ maintained acres and is home to over 24000 trees.

The Campus Arborist and 7 full-time arborists manage and maintain all trees within the campus, plus two 18-hole golf courses and 3000+ acres of farm property located south of Mt. Hope road. Five of the arborists are International Society of Arboriculture, certified arborists. In addition, the Campus Arborist has completed the Tree Risk Assessment Qualification program, sponsored by International Society of Arboriculture. The Arborists at Michigan State University have over 150 years of combined experience in the tree care industry and are highly trained in the use of equipment, safety procedures, first aid/CPR, and chemical applications. They are responsible for the inspection, trimming, removing, vine removal/trimming, building clearance, fertilizing, cabling/bracing, pest/disease control and plant growth regulators (P.G.R.) that may be required, as well as providing significant roles in the campus snow removal efforts.

Every member of the Arborist crew has the following training plus attending yearly CEU seminars.

- Aerial lift
- Loader/Articulating loader
- Toolcat
- Forklift
- First Aid/CPR/Aerial rescue
- Chainsaw safety
- Chipper safety

All arborists are required to have a CDL-B endorsement on their driver's license, as well as being state certified as a Commercial Pesticide Applicator.

The safety of the MSU community is our top priority. The trees will be maintained in a way to provide safe clearance for pedestrians and motorists as well as clear lines of vision, all while maintaining the natural shape and characteristics of unique species. While performing any type of tree work, our goal is to follow proper safety protocol as specified in the ANSI standards and to make sure that all the "personal protective equipment" (PPE) is being used.

When pruning is required, all proper pruning methods will be used to keep the tree structurally sound and healthy. Pruning around or near the Residence halls will not be done before 9 am unless in emergency situations. Only trees that are dead, dying, diseased, considered hazardous, or are unfortunately in the way of construction will be removed. No removals are performed without first receiving careful consideration from the Campus Arborist and the Curator of Woody Plants. When a tree is removed, the stump will be removed, soil replaced and seeded as soon as possible. The site will be evaluated for a potential planting site and be recorded.

Trees will be inspected routinely for signs of pests and disease, Integrated Pest Management (I.P.M.) practices will be used when considering treating affected trees. The structural integrity of the campus trees will be visually inspected to minimize risk of failure.

Soil compaction is a major problem on campus that adversely affects the root system and health of our trees. To prevent compaction, tree protection fencing is installed around the drip line of trees at construction sites; this prevents heavy equipment from driving on the critical root zone as well as protecting the tree from physical damage. During move in/out, and home football games, “no parking, save our trees” signs are placed around the trees to help remind people of the need to protect the root zone.

Appendix 4

CAMPUS WOODY PLANT PROTECTION

Note: Coordinate all plant protection and site work limits with staff landscape architect.

1. Coordinate all plant protection and site work limits with the Project Representative. SITE WORK CANNOT COMMENCE WITHOUT A PRE-CONSTRUCTION WALK-THROUGH.

   All Contractor employees engaged on the project site shall attend, or are expected to have attended, the Contractor Woody Plant Protection Seminar, hosted by MSU's IPF Landscape Services (formerly Grounds Maintenance) Division. This seminar will be presented on an annual basis at a minimum. Coordinate with the Project Representative for times and locations of the seminar(s).

2. Work by Owner
   a. Tie-back of existing plantings. Pruning, thinning, and sealing of existing plantings. Root pruning and root protection of exposed roots. Watering of existing trees under stress. Salvaging of existing small trees, shrubs, and other plant growth that the Owner wishes to retain.

Note: The following two paragraphs should be used only if the owner is to be responsible for the installation of the tree protection barricades.

3. Tree protection barricades will be provided by the owner. Plant damage occurring within installed barricades does not absolve the Contractor from damage assessment.

4. Work shall be performed by MSU IPF Landscape Services Department unless otherwise arranged, as needed to provide either preventative or remedial care to plants on a construction site. Contractor shall immediately contact the Project Representative should "protected plants" be compromised in violation of agreed upon fencing locations and work limits. Failure to communicate promptly could result in 100% damage assessment of fines.

5. Protection of Plantings
   a. Protect existing trees and other vegetation indicated to remain in place. Prohibited practices include breaking of branches, scraping of bark, or unauthorized cutting; nailing or bolting into trees or plants; use of trees or plants as temporary support (i.e. for cables); unauthorized filling, excavating, trenching or auguring within the root zone; compaction/driving over the root zone; (see definitions below), storage of any materials or vehicles within the root zone; dumping of construction waste or materials (including liquids); unauthorized removal or relocation of woody plants; removal of tree protection barricades or construction fencing prior to completion of project.
   b. Compaction within the root zone is the increasing of the soil density caused by heavy equipment or concentrated foot traffic which significantly alters the soil conditions from that which was present prior to construction.

c. The root zone of a tree is one and a half the distance of plant crown drip line outward from the stem, along undisturbed grade. Should placement of concrete be specified or authorized by the owner within the root zone, a sulfur application will be applied by the owner. The contractor shall notify the owner at least 48 hours prior to pouring concrete. Trees to receive sulfur shall be identified by owner.

Note: The following two paragraphs are to be used when the contractor is responsible for the installation of the tree protection barricades.

d. Tree protection barricades shall be wood rail fencing constructed of 4" x 4" x 11' posts, at 8' maximum o.c. and two 2" x 6" wood rails, lined with snow fence (or similar approved construction barrier fencing) which meets existing grade. Standard fence height shall be 8'; for variations see site drawings. Failure to install barricades as directed may halt work. Plant damage occurring within installed barricades does not absolve the Contractor from damage assessment.

e. All tree protection shall be installed prior to the beginning of construction and continually maintained. Tree protection shall not come in contact with anything except the construction fence, when shown on the drawings.

6. Damage
   a. Damage to campus woody plants shall include any of the items indicated in paragraph 2.a above as determined solely by the owner. The owner shall evaluate damage and establish proportional fines up to 100% of the value shown below, regardless of the current disposition of the plant.
   b. 100% Value Schedule for Campus Trees

1" – 3" caliper	$200/inch
3" – 6" DBH	$290/inch
6" – 9" DBH	$380/inch
9" – 12" DBH	$480/inch
12" – 15" DBH	$670/inch
15" DBH or greater	$960/inch

   c. DBH is the tree trunk diameter at breast height.
   d. Replacement value for shrubs, vines, and perennials shall be assessed at three times the current market cost of the plant.

7. Alternatives to the above protective measures, or any variations, must be approved by the staff landscape architect and the project representative. (Measures may include thinning and root pruning, fertilization, aeration, boring & jacking, hand excavation, supervision by campus arborist, seasonal schedule recommendations.) Alternatives would be based on the specific requirements of the plant species in question, as determined by the staff landscape architect.

8. DBH is the tree trunk diameter at breast height.

9. Replacement value for shrubs, vines, and perennials shall be assessed at three times the current market cost of the plant.

10. Alternatives to the above protective measures, or any variations, must be approved by the staff landscape architect and the project representative. (Measures may include thinning and root pruning, fertilization, aeration, boring & jacking, hand excavation, supervision by the Campus Arborist, seasonal schedule recommendations.) Alternatives would be based on the specific requirements of the plant species in question, as determined by the staff landscape architect.

Appendix 5

GUIDELINES FOR VEHICLE USE OFF ROADWAYS

We may need to drive on the turf at some point in doing our jobs. The following guidelines were developed to help you make the best choices which will do the least amount of harm to the campus environment. The Main reason for the concern of vehicles on the turf areas is due to the compaction of soils, especially around trees and plants. Once the soil is compacted, it is difficult to return it to its normal condition. Trees and plants cannot grow properly, if at all in soil that has no air space. IPF, Landscape Services is constantly struggling with compacted soils, especially around new construction sites. If we can avoid unnecessary compaction, it will benefit the University in many ways for years to come. Thank you for your help and cooperation.

1. Vehicles should not drive on the turf, especially near trees, unless there are no other alternatives.
   a. Wet soils which occur in the spring and fall will compact more readily and should be avoided, especially near trees.
   b. Driving/parking on the turf near or under the canopy (ends of branches) could damage the main feeder roots which are in this area.
   c. Rubber mats should be used when it is necessary to drive or park on turf.

2. When it is necessary to have continuous access near Trees, the IPF, Landscape Services Department should be notified to provide some form of protection to prevent soil compaction. CALL 517-355-7750
3. Maintenance and delivery vehicles should not drive on paved pathways (sidewalks) unless it is the only available option. * See University ordinances regarding this.
4. Unattended Vehicles should not be left on paved pathways (sidewalks) for reasons of public safety.
5. Not every situation is the same. Weight and size of a vehicle, type of tires, soil types, weather conditions and job requirements are always different. Following these Guidelines and policing ourselves will continue to make our Campus one of the most beautiful in the country.

Photo credit: J. Paul Swartz

Appendix 6

MICHIGAN STATE UNIVERSITY ORDINANCES

24.00 Plant Materials
24.001 Injury or removal
24.02 Plant samples for teaching and research

.01 No person shall break or cut branches or flowers or fruit, or otherwise damage or mutilate any tree, shrub, herbaceous plant, or flower upon property governed by the Board of Trustees or remove from the same any identification tag or sign.

.02 Plant samples for teaching and research may be collected from University property in Ingham County with a permit issued by the Secretary of the Board of Trustees or his or her designee.

Enacted: September 15, 1964
Amended: December 10, 1994 & April 14, 1995

Appendix 7

MICHIGAN STATE UNIVERSITY TREE REPLACEMENT POLICY

Introduction

The campus of Michigan State University (MSU) is an outdoor living laboratory for the planting and study of trees from its establishment in 1855. Tens of thousands of trees representing the great diversity of species hardy in central Michigan have been planted on the campus next to native trees that have been growing on the land that would become the MSU campus for over 300 years. An arboretum was established on the campus in 1874 by Professor William James Beal as a means to study how to grow trees, tree growth and to educate farmers across the state on the value of growing trees on land that was less productive for growing crops. Today the arboretum covers the entire 2000+ acres of the developed campus and contains over 20,000 trees. MSU is committed to the growing and care of its trees from the nursery to removal. Trees are grown or purchased and staged in the on-campus Beaumont Nursery, planted, maintained and removed by MSU Infrastructure Planning and Facilities (IPF) staff, and the wood from removed trees is repurposed by mulching or in conjunction with the MSU Forestry Department as part of the MSU Shadows Program.

As a land-grant institution, Michigan State University places a high value on its trees for their educational, aesthetic, social and environmental benefits they provide to the campus environment and community. There are many environmental benefits of trees on campus, including improved air quality, carbon storage, carbon sequestration, oxygen production, soil and riverbank stabilization, wildlife ecosystems, heat island reduction, biofuel sources, and storm-water management.

Policy

Annually, an average of 300+ trees are removed from MSU's main East Lansing campus due to various reasons such as construction, disease, weather and age. We normally plant at least 220 trees annually, leaving an approximate deficit of 80 trees. While historically it has been important to try and replace trees as they are removed, campus growth and land use has limited the ability to replace trees on a one-for-one basis. This policy will set forth guidelines for one-for-one or equivalent replacement of trees removed from the current campus urban forest inventory. This policy will also inform campus planning goals to measure and maintain a set number or percentage of trees on campus. This may be interpreted in various manners including, but not limited to, total number of trees, percentage of tree canopy to total land area, carbon sequestration value, or campus carrying capacity.

This policy will also ensure tree replacement occurs in a timely and consistent manner to mitigate the loss of canopy coverage and to ensure age and species diversity is maintained. The following goals will guide how this policy will be implemented, in conjunction with the procedures outlined in the MSU Campus Tree Management Plan (see appendix), the MSU Campus Land Use Master Plan, and the IPF Sustainability Strategic Plan.

Outcomes of this policy will be to establish and maintain a minimum number of trees and/or tree canopy on campus while working to increase the campus tree canopy and carbon sequestration value of the MSU main campus arboretum.

Goals

MSU Infrastructure Planning and Facilities (IPF) will implement and maintain a one-for-one or equivalent tree replacement program using stock from the Beaumont Nursery or our approved nursery suppliers, working with the Director of W.J. Beal Botanic Garden and Campus Arboretum, the Campus Arborist, and the MSU Landscape Architects. If possible, MSU IPF will work to exceed this one-for-one replacement goal so that the number of trees and tree canopy will increase rather than be maintained.

MSU Infrastructure Planning and Facilities will measure and report on tree removals and replacements on the main campus annually, along with canopy coverage, carrying capacity and carbon sequestration value.

Procedures

See the MSU IPF Campus Tree Management Plan for the specific procedures that support this policy, especially the Tree Replacement Procedure starting on page 7.

This policy will be reviewed every five years to ensure the validity of the goals and to adjust if necessary, based on the metrics and other factors such as new construction.

Exceptions

Any exceptions to this policy must be approved by the Director of the W.J. Beal Botanic Garden and Campus Arboretum and the MSU Campus Arborists.

Additional Resources

- MSU Campus Land Use Master Plan
- MSU IPF Sustainability Strategic Plan
- MSU IPF Construction Project Development and Management documents

Contact Information

- Director of the W.J. Beal Botanic Garden and Campus Arboretum, bealgarden@msu.edu
- MSU IPF Campus Arborist Jerry Wahl, wahlj@msu.edu

History

Created: 3/19/2020 (Final Draft for approval)
Updated:

Michigan State University Campus Tree Management Plan and MSU Tree Replacement Policy Approval

By the signatures below, this MSU Campus Tree Management Plan, including the MSU Tree Replacement Policy in Appendix 7, is approved.

Daniel J. Bollman
Vice President for Strategic Infrastructure Planning and Facilities

4-5-2020
Date

Amy A. Butler
Campus Sustainability Director

March 31, 2020
Date