



2015 Saint Paul Public School District Tree Management Program Report



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Introduction

The Saint Paul Public School District (SPPS) owns and manages nearly 450 acres of property within the city of Saint Paul. The most important uses of these properties are that of homes for the schools that educate students, offices of administration and other staff and venues for community activities. To some degree, every property has landscaping that helps provide a welcoming and attractive place to learn and to work. Among the most important landscaping elements are trees that provide a multitude of benefits to the site, the neighborhood and the community.

More than aesthetic elements of the landscape, trees on Saint Paul Public School sites provide tangible benefits such as reducing energy costs of cooling, reducing wind force, sequestering carbon from the environment, capturing airborne pollutants and greenhouse gases, reducing storm water flows by improving the movement of water into the groundwater table and adding economic value to the properties where they grow.

Research has shown that a tree's benefits are equal to three times its cost, including maintenance. Trees have been shown to shorten hospital stays, encourage customers to shop longer, reduce workplace stress and noise levels, calm traffic and lower traffic speed. Trees on SPPS properties act as living curricula for students and a resource to teachers. This was witnessed during the field portion of this project.

Diligent stewardship of this tree resource is essential. Likewise, good stewardship of the SPPS tree resource undergirds concepts learned in the classroom and sets a tangible and positive example for students, staff and the community it serves.

Integral to good stewardship of the tree resource are: 1) properly maintaining and improving tree health, 2) cultivating an appropriate diversity of tree species, 3) targeting tree selection for new plantings in order to achieve that diversity and provide maximum benefits and 4) removing potentially hazardous or undesirable trees within the scattered SPPS "forested landscape". To this end, a tree inventory and assessment was undertaken to provide a baseline of information from which to work and subsequently develop recommendations for future management. The inventory provides information to answer questions about tree diversity, tree health, immediate maintenance needs, Emerald Ash Borer (EAB) infestations and planting opportunities. The importance of EAB risks to SPPS trees provided the impetus for this project and should not be underestimated. EAB has already infested and killed trees on school property and surrounding neighborhoods.

Other deliverables of this project are a recommended policy statement about the tree resource to help guide future decisions; recommendations for forest management based on collected data and tree location; and attribute data from the inventory into a Geographic Information System (GIS) ready format for present and future use.

Tree Benefits

Trees benefit schools by providing outdoor learning environments and living specimens that support lessons taught in class. In addition, recent research has revealed other benefits trees provide. In many cases the data provide quantifiable evidence of these benefits. Most of these benefits are relevant to the school district.

Direct Benefits to SPPS:

- Direct reduction in temperatures and a corresponding reduction in cooling cost for the District.
- Decrease the volume of storm water flow, soil erosion and the associated costs of managing that flow. One mature tree can capture over 5,000 gallons of water in one year. A reduction in storm water flow by about 2% for each 5% increase in tree canopy cover. SPPS benefits from reduced storm water management costs.
- Addition of organic matter to the soil often lacking in urban areas, helping them retain water and nutrients which, in turn, enhances growing conditions for school landscapes.

Benefits to the Surrounding Environment:

- Reduction of greenhouses gases and pollutants. A shade tree properly selected and placed can reduce CO₂ buildup as much as 15 forest trees.
- Increase in the volume of water reaching the groundwater table.
- Streets with trees show reduced levels of particulates.

Benefits to the Community:

Trees add beauty and help promote pride in the community and a sense of place. Yet many of the benefits trees provide are less tangible. Here is some of what we know to be true:

- Tree-filled neighborhoods show lower levels of domestic violence according to a University of Illinois study.
- An article published in Environment and Behavior, January 2001, *Coping with ADD: The Surprising Connection to Green Play Settings*, suggests that school children with ADHD exhibit fewer symptoms when they have access to natural settings.
- Trees reduce noise levels and workplace stress.
- Healthy trees enhance property values. The sale price of a home can increase 1% for each large front yard tree and as much as 10% for one large specimen tree.
- Street trees can calm traffic and lower speeds by reducing the perceived width of a street.
- They can screen unsightly views and improve the aesthetics of most landscapes.
- Trees are part of the legacy of those who came before us.

Project Summary

This project emerged out of the need for SPPS to respond to the Twin Cities' Emerald ash borer (EAB) infestation. While this insect has not yet made the impact that it has in Michigan or the Chicago area, it was first found in Minnesota in 2009 infesting ash trees on SPPS property and in the surrounding neighborhood - Minnesota's "Ground Zero". The current concentration of ash trees in landscapes throughout the Midwest coupled with confirmation that a problem exists, prompted the need for more information in order to develop a response. Before and during this project, the school district has regularly communicated with the City of Saint Paul's Forestry staff in order to share findings, elicit recommendations and guidance and maintain relationships important to future responses to EAB and other pests.

A complete tree inventory of all maintained landscaped areas at SPPS sites found that ash trees are the most common species. Ash trees are so common to these sites that they can be considered overplanted regardless of the threat of EAB. Harding and Como Park High Schools have the most ash trees; 41 and 29, respectively. While no new infestations of EAB were found during this project on SPPS properties, early infestations are almost impossible to identify. EAB presence typically becomes clear only after several years of infestation when insect populations are high, eradication is not possible and effective management can be difficult. Therefore, it is prudent to assume that some infestations do exist. The City of Saint Paul has identified infested trees in areas close to schools. Complicating matters is the fact that many ash trees in Saint Paul and eastern Minneapolis are growing on very steep slopes making inspection and removal of infested trees unfeasible. Despite the large number of ash trees at SPPS properties, the possibility of yet unfound infestations and the close proximity of known infestations on city and private property, this situation is manageable. The recommended annual removal rate of ten percent of ash trees from SPPS properties will reduce the District's exposure to new infestations while spreading the cost of removals over time.

Of the 2,987 trees found, high school properties tend to have the most trees with Washington Technology Magnet and Harding High School accounting more than 10% of all trees. Similarly, Harding and Como Park High Schools account for over 10% of all ash trees. Despite the overrepresentation of ash trees, as many as 59 other species were identified among the 2,987 trees assessed. While the presence of so many species may lead one to believe that tree diversity is high, a better measure of diversity is how well each species is represented. In other words, a diverse tree population will have not only many species but also many trees of each species. It was found that many desirable tree species are underrepresented, indicating an unbalanced diversity that could lead to increased risk should new pests be introduced to our area. This report indicates which tree species should be planted more abundantly (i.e. oaks and disease-resistant elms) and which should be avoided (i.e. blue spruce and Norway maple) in order to provide a good balance of diversity.

The inventory also assessed the overall condition of each tree. Wounds and cracks were the most common problem found despite that over 1900 trees were considered to be in good condition. Poor form is another common problem and this is addressed with the recommendation to provide early, formative pruning in order to avoid much larger pruning projects as trees mature. Planting depth problems were common among newly planted or recently planted trees. Older trees have

likely succumbed to depth-related problems long ago. Recommendations for proper planting are also addressed.

Many of the benefits previously detailed can be optimized by planting the right tree in the right place. This is not always the case on SPPS properties. Several trees are planted too close to buildings. Shade trees are planted on the north side of buildings where the benefit that cooling shade provides does not extend to the building. South and west facing exposures are, in many cases, exposed to excessive heat due to the lack of trees or the selection of small trees and shrubs that do not provide adequate shade.

Ten sites have wooded areas that are unmaintained or marginally maintained. These wooded areas vary in size from about 2.6 acres at Battle Creek Middle School to just under a quarter acre at the Facilities site on Como Avenue. In all instances, these sites are home to invasive vegetation such as buckthorn and are underutilized as teaching tools or outdoor laboratories. These sites are used, however, by students and other passing through.

The current level of staff training in proper tree care, planting and general maintenance is undetermined. The quality of each SPPS landscape could benefit by promoting entry-level and continuing education of current and future staff that work the grounds. Many of these opportunities are affordable and readily available within the Twin Cities area.

Results

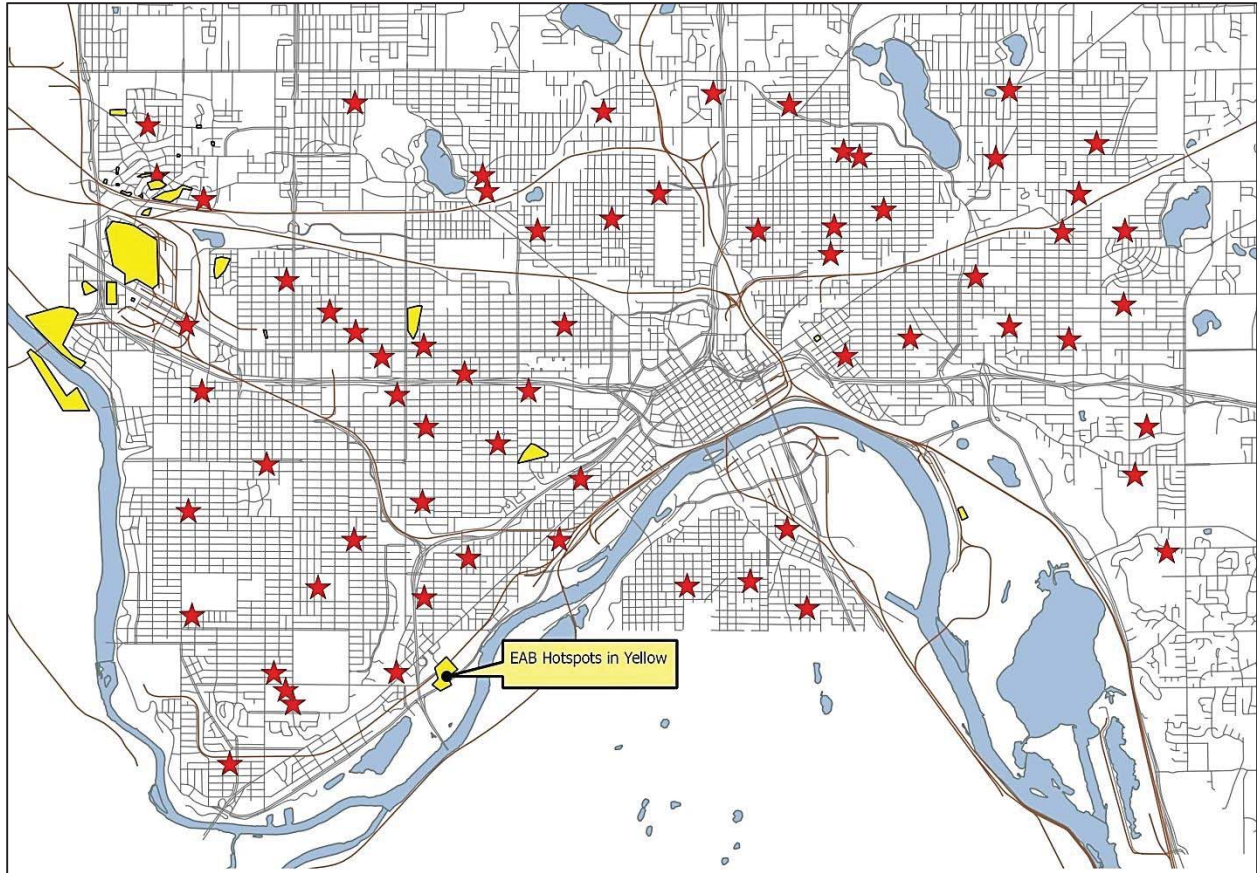
Maintained Areas

A total of 2,987 trees were found, identified and assessed on 67 District-owned properties. An additional site, Creative Arts High School/Open World Learning at 65 Kellogg Boulevard, has no trees at this time. Sixty unique tree species were identified representing 36 genera and 21 different families of trees.

The most common tree on SPPS properties is green ash with 490 individuals representing 16.4% of all trees. A handful of other ash trees (white and black ash) bring the total number of ash trees to 504 (16.9%). Sixty sites have at least one ash tree. The number of ash trees is significant because Emerald ash borer (EAB) has been found in several areas within the city of Saint Paul and this insect will inevitably kill all ash trees not treated with an appropriate insecticide, pre-emptively removed or killed/removed for some other reason. While the known Saint Paul EAB infestations are scattered throughout the city so are SPPS properties. Past EAB finds in Saint Paul and eastern Minneapolis have been on or very near some SPPS properties and any new find will surely be as well. Proximity of infested trees to other ash trees is important because the adult EAB can fly several miles to find a new host within which it can lay eggs. The map below shows the location of both known EAB sites and SPPS properties.

Tree Trivia

- ▶ The largest tree found is a 69" diameter cottonwood at the vacant Riverside site on Albion Avenue.
- ▶ Hazel Park Preparatory Academy appears to have a remnant of oak savanna north and east of the school building.
- ▶ Average diameter of all trees is 10.2"
- ▶ Average diameter of all ash trees is 13.0"



It is important to note that no ash tree on SPPS property was found to be infested with EAB during this field assessment. However, early infestations are very difficult to detect. A tree can be infested with EAB for a few years before outward signs are noticeable, even to a professional. Therefore, while not found in 2014, some or many trees could be infested at this time.

Tree Trivia

► Seven sites have no ash trees.

Tree species diversity appears high when considering the number of species found - sixty. On the other hand an important component of diversity is the abundance of individuals representing each species. Some trees are quite abundant while others are quite rare. Overall, therefore, tree diversity is less than ideal and opportunities are many.

Lindens (or basswood) are the second most common tree after ash with 288 individuals (9.6%) followed by crabapple (233 trees/7.8%), blue spruce (210 trees/7.0%), white spruce (182 trees/7.0%), Norway maple (182 trees/6.1%), honeylocust (177 trees/5.9%) and red maple (170 trees/5.7%). Other species make up less than 5% of the total number of trees. In other words eight tree species make up about 65.5% of the trees in maintained areas while the remaining 52 species account for about 34.5%.

The sites with the most trees in maintained areas are:

1. Washington Technology Magnet – 173 trees
2. Harding Senior High School – 147 trees

3. Highland Park Middle/High School – 130 trees
4. Crossroads Elementary – 117 trees
5. Rondo – 117 trees
6. Como Park Senior High School – 110 trees
7. EXPO for Excellence Elementary – 108 trees
8. Central High School – 107 trees
9. District Service Facility – 96 trees
10. J. J. Hill Montessori Magnet – 90 trees
11. John A. Johnson Achievement Plus – 90 trees

A complete listing of the number of trees at each site can be found in the appendix.

Sites with the most ash trees are:

1. Harding High School – 41 trees
2. Como Park High School – 29 trees
3. Washington Technology Magnet – 27 trees
4. EXPO for Excellence – 22 trees
5. Humboldt High School – 22 trees
6. J. J. Hill Montessori – 22 trees
7. Administrative Campus – 21 trees

All other sites had less than 20 ash trees per site. A complete list of sites and the corresponding number of ash trees at each can be found in the appendix.

Tree condition was assigned to each tree after assessing several contributing factors including poor form, the presence of wound or cracks, disease, insect problems and decay. No tree is completely without problems. A tree rated as “Excellent” will have only the most insignificant of problems. “Good” trees may have minor problems that don’t require action or require action but are quite healthy and have good form. “Fair” trees may have one or more noticeable and fairly significant problems. In some instances, taking action to resolve these problems may upgrade the assessment to “Good”. “Poor” condition trees have one or more very significant problems such as advanced decay or large wounds that might never heal. Removal is often the best action even though they might continue to live for some time with whatever problems they have. Trees rated as “Very Poor” not only have significant problems but are typically in an advanced state of decline. Death may be imminent. “Dead” trees are just what someone might assume – no parts of these trees remain living.

The distribution of trees among condition categories is:

1. Good – 1912 trees
2. Fair – 711
3. Poor – 271
4. Very Poor – 49
5. Dead – 31
6. Excellent – 13

It is worth noting that due to the project schedule, many trees were assessed before they were leafed out. There may be some trees that are over-rated because it not possible to fully ascertain the health and vigor of a deciduous tree without inspecting leaves or growing points. For example, a re-visit to Chelsea Heights School showed several small trees to be dead that did not appear so during the April 30th inspection.

Minor problems were not noted, only those that are readily noticeable and/or negatively affect the health of the tree. Several problems were quite common. The most common issue noted was the presence of unhealed or incompletely healed wounds or cracks on about 10% of trees. These were typically found on the main stem of the tree. Poor form was also common (8.3% of trees) but this is typical of trees that are not receiving high levels of regular maintenance. Almost 4% of trees had some unknown or unidentifiable dieback to some degree. This could be due to disease, insects, drought stress, root problems, frost damage, chemical damage or other issues. Fully assessing the cause of dieback would take an unacceptable amount of time and may even involve dissecting or digging up the tree.

1. Wounds/cracks – 304 trees
2. Poor form – 249 trees
3. Unknown dieback – 115 trees
4. Rot/decay – 85 trees
5. Pruning needs – 63
6. Canker¹ – 47 trees
7. Leaf or systemic disease – 39 trees
8. Borers – 33 trees
9. Suckers/sprouts – 27 trees
10. Significant lean – 21 trees
11. Girdling root – 21 trees
12. Conflict with another tree – 18 trees
13. Vandalism – 9 trees



This type of wound is typical of mower damage.

¹. Cankers are dead areas in tree stems and branches, typically sunken and caused by fungus responsible for decay.

Other issues were noted but are rarely found within this tree population.

Though not part of the field-collected database, many sites have trees planted quite close to a building; so close that even though the trees are still young, branches contact the building or will in the near future. One site custodian voiced concern over the possibility of people gaining access to the roof using such a tree.



These trees are still young yet already touch the building. If planted 10 feet further away, they would provide ample shade but require less pruning and better access between the building and the trees.

On the other hand there are some missed opportunities to provide shade to buildings. At some sites, large shade trees grow on the north or east side of the building when few or none can be found on the south or west side. Or only small trees grow where a shade tree would be much more beneficial.

Also found were trees planted too deep or improperly mulched; typically with mulch too deep at the tree trunk. Both situations can cause problems that show up years after planting either through the formation of stem girdling roots or other root related problems. Planting depth problems are likely the cause of some of the unknown dieback issues.



Surface roots have girdled this tree and will prevent further diameter growth of the trunk.

Trees that have been pruned within the past few years show evidence of a variety of skill levels possessed by those pruning. While some trees appeared professionally pruned, others had too much of a stub left attached, were pruned off much too close to the point of attachment, exhibited wounds from pruning tools over-cutting and damaging other parts of the tree or had ripped bark from limbs not properly removed.

Wooded Areas

Ten properties have unmaintained wooded areas ranging in size from less than 1/4 of an acre to 2.6 acres.

1. Battle Creek Middle School – 2.6 acres
2. Harding High School – 2.4 acres
3. Parkway Building – 2.23 acres (two areas: 2.16 acres + 0.17 acres)
4. Washington Technology – 2.27 acres

5. Frost Lake – 0.9 acres
6. Administration Building – 0.97 acres
7. Johnson Elementary – 0.94 acres
8. Wheelock – 0.66 acres
9. Highwood Hills – 0.28 acres
10. 1930 Como Avenue – 0.23 acres

Note: Acreage is approximate and estimated off of aerial photography.

The wooded and adjacent areas west of Frost Lake Magnet are maintained by Saint Paul Parks and Recreation and are not included in the results.

Battle Creek Middle School

This wooded area is located in the northwest corner of the property adjacent to Burns Avenue and is unique in that it is the only area, maintained or not, that has jack pine. Jack pine is mostly found on the eastern half of these woods while aspen is common on the western half. Large oaks (bur and red) and cottonwoods are scattered throughout along with a few, smaller black cherries and Siberian elms. Buckthorn is common here, more so on the edges of the woods.

Harding High School

Shaped like the letter “L” this area slopes steeply to the south and the west. The southern portion has Siberian elms, cottonwoods and some green ash. The western portion is sometimes open and overgrown with sumac. Where trees are dense, cottonwood, boxelder and Siberian elm are common west of the arena parking lot while boxelder, black locust and Siberian elm are common closer to 6th Street. A handful of oaks and few black walnuts can be found growing here. A few butternut trees were also found, possibly the only ones growing on SPPS property. Buckthorn is plentiful.

Parkway Building

This property has two wooded areas. The smaller is a steep, east-facing slope between the upper and lower parking lots. It is one of the poorest quality wooded areas with dead and broken trees, Siberian elms in decline, some green ash and hackberry.

The larger area is east of the lower parking lot and has a low area in its center with sparse tree cover. This may be the only wooded area now being used as a teaching tool. Siberian elms are very common. Boxelder, green ash and honeylocust ring the low area. A few black locust grow in the northeast corner of Penny Park. Dutch elm disease was also found in this area.

Washington Technology Secondary School

This woodland is part of a larger wooded area that extends west to Wheelock Parkway. Cottonwoods are the largest trees here. Red oak, green ash, black locust, black walnut, elms and boxelder are all common. Buckthorn and honeysuckle are common invasive species and some poison ivy was found in the southeast area of this woodland. At the south property line, trespass by neighboring property owners may be an issue. Property lines are indistinct so ownership is not clear.

Administration Building

Here the wooded area is a thin strip of very steep land sandwiched in between the building and the railroad tracks below. A complete assessment of this area could not be made due to the steep slope and inaccessible nature of the property. Typical of other areas, Siberian elm, boxelder and green ash are common.

Johnson Elementary

Running east-to-west along the property, this area is marginally maintained; not mowed but without shrubs. It is dominated by small cottonwoods interspersed with a few elm trees.

Wheelock Elementary

Boxelders are the most common tree growing in the strip of woods along the western property edge. Mulberry is also common and a few green ash and hackberries can also be found.

Highwood Hills

This area is part of a larger woodland south of the school building. It contains a few bur and red oaks, and some boxelders.

1930 Como Avenue

The smallest woodlot on SPPS properties, it is notable due to several dead trees, three of them quite large and found near the adjacent apartment building just west of the Facilities parking lot.

Recommendations

The following recommendations are brought forth, based on the results of site tree assessments:

1. Remove and replace ash trees
2. Provide proper balance to the existing tree diversity through targeted selection of new trees
3. Plant trees in appropriate locations (the right tree in the right place)
4. Ensure new trees are properly planted
5. Provide proper and regular tree maintenance including increasing the frequency of pruning and removing trees in poor condition or rapidly declining
6. Utilize the wooded areas as a teaching tool or outdoor laboratory
7. Provide a minimum of entry-level training to selected staff on proper pruning and planting, pest and disease identification, and general tree maintenance.

Ash Trees

Remove ash trees. While much effort is undertaken by researchers and professionals to halt the spread of EAB in the United States, no permanent solution has been found. Trees can be protected with insecticides but if treatments are stopped, these trees are again at risk to infestation, decline and eventually, death. At this time, it should be assumed that all ash trees not treated with appropriate insecticides will die prematurely from EAB if not from some other pest. No new ash trees should be planted. Indeed, ash trees for purchase are virtually impossible to find in Minnesota.

One option for the SPPS is similar to what cities such as Minneapolis and Saint Paul are undertaking with their boulevard ash population. In order to stretch out the cost of removing ash trees, many communities are treating some of the best condition ash trees with insecticides while simultaneously removing poor quality trees or those in need of significant (i.e. hazard or sightline issues). It makes little sense to prune an ash tree only to make a second visit in year or two to remove it. Following removal of poor quality trees, other ash are removed each year until all are gone. A removal goal might be to remove 10% of the total ash population each year. Replacement trees are planted soon after ash removals. Eventually these communities may choose to stop treating ash trees and remove and replace those as well. The hope is that by that time the first replacement trees will be well established and there will be diversity in the age of trees as well as their species. Having age diversity in the tree population not only provides size variety but also help spread out their eventual maturity, death and subsequent remove decades later. For the SPPS, removals should target not only those poor condition ash trees but those too close to buildings.

A similar option would be to forego insecticide treatments but undertake the rest of the process described above. A goal of 10% removal per year would be about 50 ash trees per year. While this may appear a difficult goal, the average size of all ash trees is roughly 13 inches which would not be considered a mature size. By comparison, in Minneapolis the average size of boulevard ash trees is over 15" in diameter. The drawback to not including insecticide treatments as part of the plan is that if our local EAB population grows rapidly, SPPS ash trees may die and

require removal at a rate that would exceed 50 trees per year. And their locations may be such that there is no efficient routing of crews and equipment.

Regardless of the option chosen (insecticide/no insecticide) replacement planting can be simultaneous with removals. Unlike cities faced with boulevard tree removals, freeing up planting space by removal is not necessary. New plantings do not have to be in the same location as those removed and nearly all sites have at least some space available for new trees. New plantings will be chosen to enhance overall diversity and the abundance of under-represented tree species.

Due to Minnesota's emerald ash borer quarantine which includes Ramsey County, care must be taken regarding the movement and disposal of:

1. Whole ash trees removed for any reason
2. Ash wood chips
3. Logs, stumps and branches

In short, no ash tree, chips or wood can be moved outside the Ramsey/Hennepin County quarantine area. Ash trees or parts of ash trees made into wood chips can remain or be used on site. The Minnesota Department of Agriculture maintains a list of acceptable wood disposal sites for waste ash wood. Complete language of the State's quarantine information can also be found there.

If contractors are used to remove ash trees they should be well aware of current regulations and are obliged to follow them. It is important not to move any ash wood from May 1 to September 30th. While not state regulated, this is the known flight season for the adult EAB. Moving ash wood during this time could potentially move the insect into a previously unaffected part of town or accelerate the natural spread of the insect.

Tree Diversity

Work toward an appropriate balance of tree diversity. The importance of tree diversity cannot be overstated. While all trees may give us shade, some benefits are better provided by some species than others. For example, evergreen trees can block winds better in the winter than deciduous trees like oaks. A diverse tree population also benefits birds and other animals because so many of them are specialists in terms of the food they need or the habitat they use. A diverse tree population helps prevent being overwhelmed by insect or disease problems like Dutch elm disease or EAB because there is certainty that a smaller number of trees will be affected because so many common insects and tree diseases have a narrow range of hosts.

The presence of 60 different tree species is indicative of a diverse tree population relative to species richness or quantity of different species. However, the data shows how much more abundant some species are while others are quite rare. Many trees are either not recommended (i.e. ash, Austrian pine), under-represented (i.e. buckeye, amur maackia) or exist only because they are unplanned "volunteers" (i.e. mulberry, buckthorn).

In order to improve the balance or evenness of tree species on SPPS sites, new plantings of the following trees are recommended:

1. Oaks, specifically red, northern pin, bur and swamp white oak.
2. Amur maackia
3. Ginkgo
4. Kentucky coffeetree
5. *Nannyberry*
6. Ironwood (good for shady courtyards and edge of woods)
7. Balsam fir (resin can be messy; keep this tree to areas with less frequent access)
8. *Hawthorn* (a good substitute for crabapple)
9. Elms, disease resistant varieties.
10. *Magnolias*

Trees to be planted in moderation:

1. Japanese tree lilac
2. River birch
3. *Serviceberry*
4. Black walnut (but fruit can be messy)
5. Linden (the native basswood or 'Redmond Linden' preferred)
6. *Crabapple*
7. Honeylocust
8. White spruce
9. White pine
10. Red pine
11. *Redbud* (good for courtyards)

Reasons for moderation or judicious use vary. Several are excellent choices but they either verge on being overplanted (crabapple, linden, honeylocust and white spruce) or may not be best for all sites (redbud, black walnut and pines). Evergreens are a good choice for areas north of buildings or playgrounds in order to block winter winds and act as a living snow fence. Read more on tree location in the next section.

Trees to be discontinued or avoided:

1. (Colorado) blue spruce – prone to disease
2. Norway maple – prone to disease and significant cracks
3. Austrian pine – prone to disease
4. Ash of all kinds
5. Littleleaf linden (poor form requires more frequent pruning than most trees)

Note: Trees in italics are small when mature.

While red pines are not too uncommon, it should be noted that it is our State Tree. Including at least one at every school site might make an appropriate learning tool.

Tree Location

Plant the right tree in the right place. Mentioned earlier, many trees known to grow large when mature were found to be planted too close to buildings and that can cause problems such as an

unwanted access point and unnecessarily frequent pruning or maintenance. Foundation planting of trees and shrubs can make for good landscape design but the mature size and shape must be taken into account.

Trees for shade should be selected and planted south and west of buildings and play areas whenever possible. Oaks and elms are ideal for these locations in addition to lindens and occasionally, maples. Mentioned earlier, evergreen like pines and spruce will work well to provide benefits when planted on the north side.

During the summer, overnight temperatures in courtyards may remain artificially higher than areas outside the building. For this reason, avoid trees that are native to more northerly climates and landscapes like balsam fir and native pines that might be stressed from the heat. Courtyards also provide at least some shelter from winter temperatures and winds. These summer and winter effects can be used to advantage by selecting trees from more southerly areas like black walnut, honeylocust, hawthorn, redbud and Kentucky coffeetree.

In addition to recommending the right tree for the right place, tree/site selection might make a good learning activity for students at the appropriate grade level, helping them understand the benefits trees provide and the environments in which they grow.

Proper Planting

It is highly likely that many of the young trees that are dead, showing signs of dieback or in decline have been planted too deep. Trees rarely thrive when planted too deep. While tree leaves utilize carbon dioxide for photosynthesis, tree roots need oxygen in order to take up water and nutrients. When trees are planted too deep oxygen becomes less available. Roots that do grow tend to circle the main stem and as they grow, encircle and strangle the tree. Urban soils are often compacted and low in organic matter. When planted in these soils, not only is oxygen in low supply but roots have difficulty penetrating the dense soils. These soils also remain waterlogged longer than loose soil, exacerbating proper root function.

Three recommendations will help ensure young tree survival and prevent planting depth problems. First, contracts for planting should contain proper specifications and planting project should be monitored and inspected. Readily available specifications have been written by the Minnesota Department of Transportation (MnDOT). Many contractors are already familiar with these specifications.

Second, staff, students, volunteers and community groups that plant trees should all learn the basics. The Minnesota Department of Natural Resources has a useful, easy to understand online guide that is well documented with photographs. The University of Minnesota Extension also has an online guide. Read more on formal training opportunities later in this report.

Third, ensure the highest quality stock available and make certain you get what you want. When purchasing trees for planting, inspect, select and tag (or paint) the selected trees at the nursery. Ensure the tagged trees are the ones that arrive at the planting site.

Tree Maintenance

Mulching. Applying mulch to all new tree plantings and maintaining a sufficient layer of mulch until the tree is well established is highly recommended. Mulching young trees can be very beneficial as an aid to establishing a robust root system. Mulch helps retain soil moisture and adds organic matter that is very often in short supply in urban soils. Soil compaction from foot traffic can be harmful to tree root systems and mulch helps prevent compaction. But if trees are mulched improperly there may be little benefit to the tree. In fact, improper mulching can lead to reduced growth above and below ground. Mulch should be very shallow against the tree trunk and deepest at the dripline of the tree or edge of the mulch ring. Four to six inches is an appropriate maximum depth for new trees. After a couple of years three or four inches may suffice. The resulting shape should be something like a saucer shape. See appendix for more information.

Contact from mowing equipment and other activities will change the shape of a mulch ring, pushing it towards the tree trunk resulting in too much against the trunk and not enough at the edges creating a “volcano” effect. Therefore, regular (at least annual) reshaping, regrading and “topping off” are recommended in order to maintain the proper shape and depth.

Pruning

Consider early, formative pruning to be part of the planting process (and expense). General pruning needs and poor form that might benefit from pruning were noted in fewer than 19% of all trees. However, nearly all trees could benefit from some pruning, even though it may mean the simple removal of small branch. Regular or cyclic pruning of all trees may not be practical for sixty nine sites, but this simple recommendation can help reduce the need for frequent pruning, trunk splitting or major branch loss. At the time of planting, each tree should be pruned to avoid future problems. Competing leaders should be cut back to a single leader. Rubbing or crossing branches should be removed. Branches with poor angle of attachment (i.e. too narrow of an angle) or with included bark should also be removed. Five minutes spent pruning a newly planted tree can prevent a time-consuming and expensive pruning job 15 or 20 years later. This task can be written into contractor specifications but some additional follow-up pruning may be necessary regardless of a contractor’s best efforts.

Pruning and removal of large branches and leaders, or pruning that removes significant amounts of live wood from a tree should be performed during the dormant season to help eliminate problems from insects and diseases that key in on the type of stress that occurs in relation to these actions. Of course, removal of any portion of a tree that might present a hazard should be performed as soon as possible to ensure safety.



The crack in the tree on the left might have been prevented by proper pruning when the tree was young. Now it will likely split, causing a significant wound like that seen on the tree on the right.

The second part of this pruning recommendation involves addressing the 127 trees recommended for pruning during the assessment. Begin with those 92 trees considered to be of higher priority and prune them within 12 months. Not all of these trees are large. Many could be pruned with hand tools from the ground. The remaining 35 trees could be pruned at a later time but it may prove more efficient to prune them at the same time as higher priority trees if they are in close proximity to each other.

Removals

Tree removals should be addressed similarly to pruning; highest priority first then moving two lower priority trees. 234 trees removals are recommended. Once again, not all trees are large. Many are newly planted trees that did not survive the first season.

Tree assessed as having a high likelihood of imminent failure have already been turned in to Facilities staff and should no longer be found at their respective sites.

Wooded Area Utilization

Perhaps with the exception of the semi-maintained area at Johnson Elementary, only the wooded area at the Parkway Building appears to be used to support classroom learning. More common, they appear neglected, overgrown with invasive species and, perhaps, used more by neighbors and those passing through than by the school district. Though these are not high quality woodlands, there are many opportunities.

Three recommendations are offered:

1. Remove invasive species such as buckthorn and honeysuckle that degrade the function of these small woodlands.
2. Regularly inspect these areas for potentially hazardous trees and remove or prune them as needed. Students and others in the community visit or travel through these areas so safety and security should always be an ongoing goal.
3. Increase and maximize the use of these areas as outdoor learning centers for students and the community. The School Forest Program of the Minnesota Department of Natural Resources is an example of a program that could be utilized to a greater extent than it at this time.

Training

Provide entry-level training and continuing education for staff involved in regular grounds maintenance. First, this will help staff identify tree-related problems at an early stage giving the most possible time to respond. Early detection of and quick response to problems often translates to lower costs. Second, proper training will help staff oversee or guide tree and landscape contract work. Third, trained staff will be more aware of tree-related issues that require outside professionals.

Training options need not be expensive. The annual Shade Tree Short Course is held every March in the Twin Cities and offers two days of classes that range from basic to technical targeted towards students, beginners, volunteers, public works and facility staff, tree care professionals and educators. Cost is typically under \$200 per person.

Tree inspector training is focused more towards tree pests and hazards identification. Offered several times each year, this one day workshop costs \$80 per person in 2014 and includes the cost of an exam.

Minnesota First Detector training is similar to tree inspector training but is focused towards someone with an existing background in tree health. It could be viewed as training in addition to the options mentioned, above. Cost is \$40 and requires on-line training prior to the workshop and subsequent exam.

The Minnesota Northern Green Expo has many educational opportunities including those focused toward Certified Pesticide Applicators pre-exam training and required continuing education. This winter event is held in Minneapolis and has the broadest participant base with attendees from the staffs of golf courses, public works departments, grounds maintenance companies, tree care companies, garden centers, landscape contractors in addition to volunteers from all walks of life. About 4.7% of the attendees each year work in the School Grounds industry segment. Costs for the upcoming January, 2015 event are not yet available.

Of the above mentioned training opportunities, the Shade Tree Short Course and the Northern Green Expo would be the best starting points for SPPS staff as well as offering continuing

education to staff wishing to expand tree knowledge and tree care skills over the years of their service to the school district.

Conclusion

The large quantity and high percentage of ash trees within the tree population are significant and cause for action due to the presence of EAB in Saint Paul and the way they skew the balance of diversity. The lack of any clear evidence of EAB infestations on SPPS property is good news for the time being. But acting soon to remove and replace ash trees will help the school district stay ahead of likely and predictable increases in EAB infestations that might otherwise prove overwhelming. And, removing and replacing these trees will help resolve the lack of abundance of many desirable tree species when performed over time.

Good site selection for new trees goes hand in hand with appropriate tree selection. The former helps maximize the benefits each tree provides and the later helps provide an abundance of trees now all too rare in SPPS landscapes. Remember, “The right tree in the right place, properly planted”.

Proper and timely maintenance of all trees but particularly those planted will lessen tree defects, extend their useful lifespan and keep costs reasonable under control by performing smaller pruning tasks up front rather than later when the need is urgent and the jobs are large and expensive. Proper care of these landscapes around the buildings will mirror the care taken by faculty and staff inside the walls.

Students, parents and communities can help plant and maintain trees and then benefit from their function. Trees not only supply physical benefits but can help support the mission of the Saint Paul Public School programs as they augment classroom learning with real, hands-on examples.

Appendix

Number of Trees at Each Site

Site ID	Program/Site Name	Address	# Trees
1000002	1780 W 7th St	1780 7th St W	9
1000005	Adams Spanish Immersion School	615 Chatsworth St S	38
1000007	Administrative Campus	360 Colborne St	84
1000077	AGAPE	1037 University Ave	17
1000079	American Indian Magnet School	1075 Third St E	26
1000008	Barack and Michelle Obama Elementary	707 Holly Ave	26
1000010	Battle Creek Elementary School	60 S Ruth St	77
1000009	Battle Creek Middle School	2121 Park Dr N	37
1000064	Benjamin E Mays International Magnet	560 Concordia Ave	N/A
1000007	Bridge View	360 Colborne St	N/A
1000011	Bruce Vento Elementary School	409 Case Ave E	21
1000064	Capitol Hill Gifted & Talented Magnet	560 Concordia Ave	N/A
1000012	Central High School	275 Lexington Pkwy N	107
1000014	Chelsea Heights Elementary School	1557 Huron St	45
1000015	Cherokee Heights Elementary School	694 Charlton St	23
1000016	Como Park Elementary School	780 Wheelock Pkwy W	20
1000017	Como Park Senior High School	740 Rose Ave W	110
1000018	Creative Arts High School	65 Kellogg Blvd E	N/A
1000019	Crossroads Elementary	543 Front Ave	117
1000020	Dayton's Bluff Achievement Plus Elementary	262 Bates Ave	42
1000021	District Service Facility (DSF)	1930 Como Ave	96
1000023	Eastern Heights Elementary School	2001 Margaret St	21
1000024	EXPO for Excellence Elementary	540 Warwick St	108
1000025	Farnsworth Aerospace Lower Campus	1290 Arcade St	17
1000026	Farnsworth Aerospace Upper Campus	1000 Walsh St	21
	Focus Beyond	340 Colborne St	N/A
1000027	Four Seasons A+ Elementary School	318 Moore St	22
1000029	Frost Lake Magnet	1505 Hoyt Ave E	39
1000030	Galtier Community School	1317 Charles Ave	20
1000031	Gordon Parks High School	1212 University Ave	21
1000032	Groveland Park Elementary School	2045 St Clair Ave	29
1000033	Hamline Elementary School	1599 Englewood Ave	51
1000034	Harding Senior High School	1540 Sixth St E	147
1000035	Hazel Park Preparatory Academy	1140 White Bear Ave N	67
1000036	Highland Park Elementary School	1700 Saunders Ave	37
1000038	Highland Park High School	1015 Snelling Ave S	130
	Highland Park Middle School	975 Snelling Ave S	N/A
1000037	Highwood Hills Elementary School	2188 Londin Ln	39
1000039	Homecroft Early Learning Center	1845 Sheridan Ave	36
1000040	Horace Mann Elementary School	2001 Eleanor Ave	35
1000041	Hubbs Center	1030 University Ave W	25
	Humboldt Junior	640 Humboldt Ave	N/A
1000042	Humboldt High School	30 Baker St E	77
1000044	J.J. Hill Montessori Magnet School	998 Selby Ave	90

1000043	Jackson Elementary	437 Edmund Ave	27
1000033	Jie Ming Mandarin Immersion Academy (at Hamline)	1599 Englewood Ave	N/A
1000045	John A Johnson Achievement Plus Elementary	740 York Ave	90
1000046	Johnson Aerospace & Engineering High School	1349 Arcade St	65
1000047	Journey's Secondary	90 Western Ave	12
1000048	LEAP High School	631 Albert St N	13
1000058	L'Etoile Du Nord French Immersion Lower Campus	1305 Prosperity Ave	35
1000006	L'Etoile Du Nord French Immersion Upper Campus	1760 Ames Place	13
1000051	Linwood Monroe Arts Plus - Linwood Campus	1023 Osceola Ave	18
1000050	Linwood Monroe Arts Plus - Monroe Campus	810 Palace Ave	15
1000052	Maxfield Elementary School	380 Victoria St N	23
1000053	Mississippi Creative Arts School	1575 L'Orient St	22
1000055	Murray Middle School	2200 Buford Ave	26
1000056	Nokomis Montessori Magnet School North	985 Ruth St N	51
1000068	Nokomis Montessori Magnet School South	525 White Bear Ave N	17
1000018	Open World Learning	65 Kellogg Blvd E	0
1000049	Parkway Montessori and Community Middle School	1363 Bush Ave E	15
1000057	Phalen Lake Hmong Studies Magnet	1089 Cypress St	12
1000059	Ramsey Middle School	1700 Summit Ave	34
1000060	Randolph Bus Garage	533 Randolph Avenue	N/A
1000061	Randolph Heights Elementary	348 Hamline Ave S	33
1000062	900 Albion	900 Albion Ave	57
1000063	Riverview - Vacant	271 Belvidere St E	14
1000065	Riverview West Side School of Excellence	160 Isabel St E	27
1000064	Rondo	560 Concordia Ave	117
1000067	Saint Paul Music Academy	27 Geranium Ave E	10
1000070	St Anthony Park Elementary School	2180 Knapp St	24
1000071	Student Placement Center	2102 University Ave	8
1000072	The Heights Community School	1863 Clear Ave E	21
1000074	Washington Technology Magnet School	1495 Rice St	173
1000075	Wellstone Elementary	1041 Marion St	60
1000076	Wheelock Early Education	1521 Edgerton St	28

Total # Trees = 2987

Number of Ash Trees Per Site

Site ID	Name	Count	% of Trees on Site
1000034	Harding H. S.	41	27.9
1000017	Como Park H. S.	29	26.4
1000074	Washington Technology Magnet	27	15.6
1000024	EXPO for Excellence	22	20.3
1000042	Humboldt H. S.	22	28.6
1000044	J. J. Hill Montessori	22	24.4
1000007	Administrative Campus	21	25.0
1000012	Central H. S.	16	15.0
1000010	Battle Creek Elementary	15	19.5
1000033	Hamline Elementary	15	29.4
1000059	Ramsey Middle	15	44.1
1000075	Wellstone Elementary	15	25.0
1000043	Jackson Elementary	13	48.1
1000014	Chelsea Heights	12	26.7
1000045	John A. Johnson Elementary	12	13.3
1000009	Battle Creek Middle	11	29.7
1000029	Frost Lake Magnet	11	28.2
1000077	AGAPE	11	64.7
1000020	Dayton's Bluff Elementary	10	23.8
1000038	Highland Park Campus	9	6.7
1000021	District Service Facility	8	8.3
1000023	Eastern Heights Elementary	8	38.1
1000036	Highland Park Elementary	8	21.6
1000062	Riverside	8	14.0
1000027	Four Seasons	7	31.8
1000037	Highwood Hills Elementary	7	17.9
1000079	American Indian Magnet	7	26.9
1000015	Cherokee Heights Elementary	6	26.1
1000046	Johnson H. S.	6	9.2
1000035	Hazel Park	5	7.4
1000039	Homecroft Early Learning	5	13.9
1000051	Linwood Monroe/Linwood Campus	5	27.8
1000058	L'Etoile Du Nord Lower	5	14.3
1000072	The Heights Community School	5	23.8
1000005	Adams Spanish Immersion	4	10.5
1000006	L'Etoile Du Nord Upper	4	30.7
1000025	Farnsworth Aerospace Lower	4	23.5
1000032	Groveland Park Elementary	4	13.8
1000055	Murray Middle School	4	15.4
1000008	Barack and Michelle Obama Elementary	3	11.5
1000016	Como Park Elementary	3	15.0
1000048	LEAP H. S.	3	23.1
1000053	Mississippi Creative Arts	3	13.6
1000061	Randolph Heights Elementary	3	9.1
1000067	Saint Paul Music Academy	3	30.0
1000071	Student Placement Center	3	37.5
1000002	1780 W. 7th Ave.	2	22.2
1000011	Bruce Vento Elementary	2	9.5
1000026	Farnsworth Aerospace Upper	2	9.5
1000030	Galtier Community	2	10.0
1000047	Journey's Secondary	2	16.7

1000050	Linwood Monroe/Monroe Campus	2	13.3
1000056	Nokomis Montessori North	2	3.9
1000063	Riverview	2	14.3
1000068	Nokomis Montessori South	2	11.8
1000070	St. Anthony Park Elementary	2	8.3
1000040	Horace Mann Elementary	1	2.9
1000049	Parkway Montessori	1	6.7
1000057	Phalen Lake Magnet	1	8.3
1000064	Rondo Center	1	0.9

Tree Species Count

Species	Count	% of All Trees
Ash, green	490	16.4
Linden	288	9.6
Crabapple	233	7.8
Spruce, blue	210	7.0
Spruce, white	209	7.0
Maple, Norway	182	6.1
Honeylocust	177	5.9
Maple, red	170	5.7
Hackberry	126	4.2
Pine, Austrian	104	3.5
Maple, sugar	86	2.9
Pine, red	62	2.1
Oak, bur	49	1.6
Cottonwood	44	1.5
Treelilac	41	1.4
Elm, American	36	1.2
Maple, amur	34	1.1
Juniper, Rocky Mountain	32	1.1
Oak, swamp white	31	1.0
Birch, river	29	1.0
Oak, eastern pin oak	28	0.9
Cherry	24	0.8
Elm, Siberian	24	0.8
Pine, white	24	0.8
Oak, red	20	0.7
Redcedar, eastern	17	0.6
Hawthorn	16	0.5
Aspen	15	0.5
Maple, silver	15	0.5
Serviceberry	15	0.5
Pine, Scots	14	0.5
Boxelder	13	0.4
Plum	12	0.4
Walnut, black	12	0.4
Ash, white	10	0.3
Birch, paper	10	0.3
Kentucky coffeetree	9	0.3
Ginkgo	7	0.2
Mulberry	7	0.2
Nannyberry	7	0.2
Olive, Russian	6	0.2
Whitecedar	6	0.2
Dogwood	5	0.2
Redbud	5	0.2
Ash, black	4	0.1
Fir, balsam	3	0.1
Fir, white	3	0.1
Ironwood	3	0.1
Locust, black	3	0.1
Maakia, amur	3	0.1
Buckeye, Ohio	2	0.1

Chokecherry, Amur	2	0.1
Pine	2	0.1
Willow	2	0.1
Buckthorn	1	0.0
Catalpa	1	0.0
Horsechestnut	1	0.0
Magnolia	1	0.0
Mountainash	1	0.0
Pine, mugo	1	0.0

Tree Genus Count

Genus	Count	% of All Trees
Fraxinus (Ash)	504	16.9
Acer (Maple)	500	16.7
Picea (Spruce)	419	14.0
Tilia (Linden)	288	9.6
Malus (Apple)	233	7.8
Pinus (Pine)	207	6.9
Gleditsia (Honeylocust)	177	5.9
Quercus (Oak)	128	4.3
Celtis (Hackberry)	126	4.2
Ulmus (Elm)	60	2.0
Populus (Poplar)	59	2.0
Juniperus (Juniper)	49	1.6
Syringa (Lilac)	41	1.4
Betula (Birch)	39	1.3
Prunus (Cherry)	38	1.3
Crataegus (Hawthorn)	16	0.5
Amelanchier (Serviceberry)	15	0.5
Juglans (Walnut)	12	0.4
Gymnocladus (Coffeetree)	9	0.3
Ginkgo (Ginkgo)	7	0.2
Morus (Mulberry)	7	0.2
Viburnum (Viburnum)	7	0.2
Eleagnus (Olive)	6	0.2
Thuja (Arborvitae)	6	0.2
Abies (Fir)	6	0.2
Cornus (Dogwood)	5	0.2
Cercis (Redbud)	5	0.2
Ostrya (Ironwood)	3	0.1
Robinia (Locust)	3	0.1
Maackia (Maackia)	3	0.1
Aesculus (Horsechestnut)	3	0.1
Salix (Willow)	2	0.1
Rhamnus (Buckthorn)	1	0.0
Catalpa (Catalpa)	1	0.0
Magnolia (Magnolia)	1	0.0
Sorbus (Sorbus)	1	0.0

Saint Paul Public Schools Tree Management Policy Statement

Introduction

Saint Paul Public Schools recognizes that trees are an asset; important to our environment and significant in the role they play in achieving our Mission, “To provide a premier education for all.” Trees provide many benefits: to the environment, to our community, to our students, staff and facilities. In order to sustain and maximize these benefits, Saint Paul Public Schools (SPPS) adopts the following policy.

Policy Objectives

The objectives of this Tree Management Policy are to:

- broaden the emphasis of our tree management to include urban forestry principles and best management practices in order to maximize tree benefits
- improve the quality and coverage of SPPS tree canopy cover
- achieve and maintain an appropriate diversity of tree species
- respond to immediate and future tree pests
- prioritize the maintenance of the existing tree population
- enhance the School District’s reputation as a steward of the tree resource.

Strategies

The Tree Management Policy is divided into three key areas:

1. Tree Selection and Planting
2. Tree Removal and Replacement
3. Tree Asset Management

Tree Selection and Planting

SPPS recognizes that low or unbalanced tree species diversity can create a tree population vulnerable to existing and future insect and disease attacks. Therefore, SPPS will proactively identify planting opportunities across all its properties. The guiding principle will be “Planting the right tree in the right place at the right time.” Existing tree inventory data will be used to indicate species of trees overplanted and those whose numbers should be increased.

The following principles will be applied:

- Tree location – Planting locations will be selected to improve canopy cover and maximize tree-related benefits. Planting locations will not interfere with safety or significantly interfere with other site maintenance operations
- Tree selection – Tree species will be selected based on diversity (site and District-wide), function, aesthetics and resistance to current and potential insect and disease threats.
- Tree quality – Trees will be of the highest quality available, grown according to the latest best practices and standards.

- Installation – Planting guidelines will follow the best practices and standards at that time such as those described by the University of Minnesota Extension. These guidelines will be followed by staff, contractors and volunteer.
- Community involvement – The District will encourage community involvement in tree planting, including students, parents, staff and other groups directly or indirectly attached to the day to day operations of school sites.

Tree Removal and Replacement

Like all living things, trees will eventually die and must be removed. Other situations may also necessitate removal: hazardous tree conditions, insect and disease outbreaks, construction projects and more. Tree removal will be undertaken thoughtfully and the following principles will be applied:

- Hazardous trees or trees that create a risk to public safety or property will be given top priority
- Secondary priority will be given to trees dead or declining from insects, disease, storm damage, vandalism or other mechanical damage
- Replacement of removed trees will be performed as soon as possible but exact location will be considered on a case by case basis

Tree Asset Management

The multitude of benefits trees provide and the costs of planting, maintenance and removal compel the District to look upon trees as assets. The science of urban forestry, its concepts and practices will guide proper tree asset management using these principles:

- Ongoing maintenance of the existing tree database created in 2014,
- Monitoring existing pest problems and acting preemptively to pest issues that may soon be affect our community,
- Proactively manage tree risks,
- Regularly prune trees to improve structure and provide safe sight lines,
- Update recommendations to reflect present and future conditions.