# City of Maplewood, Minnesota – Boulevard Tree Plan

Report Compiled by: University of Minnesota, Department of Forest Resources
Urban Forest Management Class, FR 4501/5501:
Hannibal Hayes, Zach Hylinski, Joe Larson, Jeff Martin and Philip Potyondy.
Gary Johnson, Instructor
April 7, 2009



## I. INTRODUCTION AND BACKGROUND

"The muddle (i.e., confused mess) of the boulevard trees…is a subject worth rubbing into the sensibilities of the citizens who are supposed to take some interest occasionally in the more general affairs of the community. (note: The proposal for boulevards trees was denied by the mayor, despite the support of the community, four times over the past two years) Authority for the work contemplated was to be vested in the Parks Department, which seemed to be the proper agency to carry out such a law, but no provision for the expenditure of money…was made. Had this bill become law two years ago and had any reasonable, intelligent effort been made to make available its provisions, it is safe to say that the unfortunate muddle of the trees…could have been avoided or at least ameliorated.

What is needed only is that this, like any other work worth doing, should be well done. First is required a carefully selected young nursery-raised tree, sound, shapely and with good roots; next an ample provision of soil for the support of the trees and (finally) the work of planting and protecting the tree…(be) properly done."
*John Culyer, New York City to the City of New York, October 4, 1900.*
(This letter was published in the New York Times on October 7, 1900. John Culyer was a member of the New York Tree Planting Association.)

### ROW vs. Traditional Boulevards

Boulevards (originally termed "tree lawns") are defined as the space between the outside edge of a street and/or curb and the city/state Right-of-Way (ROW) property line. Boulevards may or may not include sidewalks; however, if they do, the boulevard is then commonly considered the area between the public sidewalk and the inside of the street or street curbing.

Benefits of boulevard trees or street trees have been documented in a number of perspectives, but specifically the Midwest has been the site and source of many surveys and community forestry analyses. Documented benefits include the more difficult-to-

measure, yet critical community benefits. Of those, the most notable benefits relate to health (decreased healing times for hospital patients), education (higher youth academic scores, higher academic involvement with youth), decreased crime and increased safety (literally, lower incidences of violence in canopies versus barren housing developments), increased economic development (higher retail rates for businesses near public tree canopies) and greater community empowerment and involvement.

Not all social/community benefits are as measurable. The everyday natural surroundings of an urban forest provide a deep emotional, almost spiritual attachment to the trees and community for many people. Often, families plant trees in memory of a loved one or as a family project. As the family grows, the tree grows. Community involvement in public tree planting helps develop a stronger link between the involved citizens and the community, nurturing a sense of community pride and citizen ownership.

Environmental benefits from urban trees are more common, objective and well-documented than some of the social benefits. In a recent urban tree assessment and evaluative study conducted in Minneapolis, environmental benefits were found to be consistent with other cities in the Upper Midwest. Mature and healthy trees offer a range of environmental benefits that can be measured, can be translated as dollars earned or saved. For instance, healthy and mature small trees present an annual dollar benefit range from $3-15/tree. For medium sized trees, the benefits range from $4-34 per tree per year, and for large, mature trees, the range is $58-76. Big, healthy, mature trees return big benefits.

### Status of Boulevard Tree Ordinances or Policies in the TCMA

A review of the on-line versions of boulevard tree ordinances or policies for communities in the Twin Cities Metropolitan Area (TCMA) revealed that most communities had a boulevard tree plan on record. These plans ranged from detailed and comprehensive tree selection, placement, planting and subsequent care (e.g., West St. Paul, St. Paul, Eagan, Chanhassen, Minnetonka, St. Louis Park, Farmington, Hastings, Apple Valley), to communities that either ban boulevard trees (Bloomington) or place part of the responsibilities on property-owners (Burnsville). In most communities, developed boulevard tree programs are imbedded in larger, more comprehensive urban forestry programs.

## II. SITE CRITERIA

### Site Preparation

-Impact of soils

**Soil test**. Prior to selecting species for the various boulevards, a soil test shall be conducted to determine organic matter content, pH, and amount of soluble salts in particular. All of these soil characteristics will affect the species selection.
**Drainage and Compaction tests.** Percolation test – dig a hole 24" deep, fill with water and let drain, refill and time how long it takes to drain. Complete drainage within 24 hours indicates a soil with an adequate percolation rate.

Portable static cone penetrometer- is a modified soil probe that measures resistance of a probe when pushed into the ground. A soil with a penetrometer reading of 300 psi or less is considered adequate for tree root establishment. **Soil amendment**s. Anything deficient should be corrected prior to planting boulevard trees. Organic matter will add nutrients to the soil and help prevent soil compaction. Compacted soils can be moderated by loosening the soil in the area with a tiller, auger, backhoe, or shovel. If soil will be unable to sustain a healthy tree, total soil replacement should be considered.

-Grading

Trees should only be planted in either neutral or positive grades. Negative grades (depressions) should be amended to improve drainage or not be considered for planting.

-Sightlines

Trees must not block or obstruct drivers from seeing other traffic, road signs, pedestrians, etc. No branches lower than 6'6" should be planted within sightline zones.

-Boulevard Widths

The amount of space available on a boulevard is an important factor in species selection. Roots will not grow to their full potential if they are cut off by sidewalks, curbs, or roads. If trees are placed too close to the road, there is a risk of damage from deicing salt and plows, and damage from trucks to the low-hanging branches. A minimum boulevard width (recommended as a minimum of 10 feet) should put into effect in order to ensure the proper amount of room for growth.

-Spacing

Adequate spacing of trees will reduce the competition for resources (water and nutrients) by tree roots, resulting in weakened trees. Consider the mature size of the tree in your spacing plan. Minimum spacing for a mature large tree is 25 feet.

**Costs Associated with Site Preparation**

It should be expected that inspecting and researching soil types, sightline considerations, boulevard widths, and spacing will all come at an expense associated with employee payroll. These costs are essential to the health and longevity of the selected tree species, and should be considered in the overall budget of a boulevard tree program.

Approximated site preparation labor and materials expenses can be calculated using one of two available resources: 'Landscape Data Manual' or "Kerr's Cost Data for Landscape Construction." These manuals break down site preparation requirements such as soil loosening and equate them to a range of required labor hours or machinery hours.

Costs vary greatly depending on the condition of the planting site, the size and spacing of plant materials and general site access. It is recommended that all site preparation and planting of trees be contracted out to qualified landscape installation contractors on a low-bid basis. It is recommended that the City of Maplewood contact the Minnesota Department of Transportation and obtain a current copy of the "Inspection and Contract Administration Manual for MnDOT Landscape Projects and use these criteria for establishing low-bid contract specifications.

**Street Proximity and Minimum Boulevard Widths**

As specified under 'site preparation', adequate spacing and distance from street to tree are integral to the health and safety of any tree. Therefore, it is recommended that a minimum boulevard width (10 feet) be enacted on any new boulevard in order to promote proper root growth and tree health. In the absence of a formal boulevard, a minimum distance of 16-18 feet from the inside edge of the street curbing should be advocated on residential-lined streets (this allows for the future option of a 10 foot wide boulevard, a 5 foot wide public sidewalk and a safe distance of approximately 3 feet from the previously installed tree; this distance will minimize any damage to the trees' root systems from the installation of the hardscapes). For arterial streets not lined with residential properties, move the trees as far away from the edge of the street as possible.

**Planting Specifications**

- Tree Size

  A minimum size of 1 ¼ " to 2" caliper tree, either bare-rooted, containerized or balled and burlapped (B&B).

-Inspect tree

  Prune out any dead or broken branches and codominant leaders. Do not prune species during their insect and disease susceptibility periods during the growing season. For example, do not prune oaks during the spring and summer because of the increased chances of spreading oak wilt.

  Uncover the root flare in order to avoid "planting" the trees too deep. Deep planting leads to a decline in tree health and the development of stem girdling roots (SGR). These (SGR) will eventually strangle the tree causing death or a unstable hazardous tree. Also remove any damaged or circling roots around the root ball.

-Digging the hole

  Hole size needs to be twice the diameter and the same depth as that of the root ball. If the tree is being planted in poorly drained soils the root ball should be planted a few inches above soil grade. Organic matter can be added at this time if required.

-Planting

Trees should be planted straight and stable. If the trees require additional support from stakes, only install as necessary. It is recommended that the staking specifications as provided in the Mn/DOT Inspection and Contract Administration Guidelines be followed.

Back fill the planting hole making sure to compact the backfill soil every couple of inches. Finally, mulch an 18 inch (or greater) radial ring, 4 inches deep around the tree but do not cover any of the stem with mulch.

-Ongoing Maintenance

1.5 gallons of water should be given for each diameter inch of the trunk. Watering frequency will vary in accordance with soil type, boulevard width, weather conditions, etc.

**Sightline Safety Consideration:**

Set back low vegetation (shrubs and grasses) from roads and intersections.
*For instance, Minneapolis guidelines states no boulevard plantings above 36" except in sightline zones (such as intersections), where they may be no taller than 18". Sightline zones are defined in Minneapolis as 40' from a road intersection and 5' from a driveway or alley.*

**Utility Consideration**

*For overhead utility considerations see "Plant Size" below.*
Do not plant above buried utilities. The further a tree is planted away from buried utilities the less likely it is to sustain harmful root damage during utility maintenance.
*For instance, Concord MA recommends planting a minimum of 10' away from buried utilities and a preferred distance of 20' (see Concord reference).*

**Distance from light posts and hydrants**

To avoid root damage from utility maintenance, do not plant trees close to light poles, hydrants, etc.
*For instance, Concord MA recomends a minimum distance of 10'*
Choose from Large Trees (over 50 ft.) and Medium Trees (26 - 50 ft.) so that the crown can eventually be raised above the light.
If desired, use plantings for the "Non-tree Boulevards" Scenario near light posts and hydrants.

**Spacing**

With the goal of continuous tree canopy, we recommend plant spacing that is relative to tree canopy size. In urban forests a good rule of thumb is to assume a tree will achieve 2/3 mature canopy height and spread as it would in ideal/natural environments.

**Risk Management**

A boulevard tree program must be integrated with the community's overall risk management plan for the urban forest. Boulevard trees must be community assets and

like any other infrastructure asset, they should be monitored on a regular basis for early detection of defects that may be classified as tree hazards. A defect may or may not indicate the need for immediate action. A hazard is the determination that a defect could cause a failure that would damage or injure private or public property, infrastructure such as utility lines or injury to people. Risk assessment is the likelihood that the hazard would happen and the degree of damage or injury that is most likely. Risk management is the orderly process of monitoring, predicting and preventing hazards from developing and causing damage or failure.

Risk assessment and management of boulevard trees is no different than any other public infrastructure such as buried or suspended utilities, street lights or public sidewalks. It is, however, unique in that it is an evaluation of biology and physics in many cases and needs to be conducted by qualified personnel on a regular basis.

## III. DESIGN CRITERIA

**Note: "Typical" Scenarios.** All design criteria are organized into "typical" design scenarios and are intended to provide flexible guidance.

### A. Right of way / Green easements

**Plant Size.**

**Options:** Large Trees (over 50 ft.), Medium Trees (26 - 50 ft.), Small Trees (under 25 ft.), Shrubs (if setback from road sides and intersections).
**Suggested:** Large Trees (over 50 ft.)

***If over head lines are present:***
***Options:*** *Only plant trees with maximum expected heights that will not reach the height of the lowest overhead line.*

***Suggested:*** *The largest tree that will not reach the height of the overhead lines.*

***Examples:***
*High power lines (primary distribution lines) 45-50 feet high*
*use Medium Trees (26 - 50 ft.) or Small Trees (under 25 ft.)*
*Low power lines (20-25 feet) use Small Trees (under 25 ft.)*

**Specimen vs Copse**

Both specimen and copse (groupings of 3 or more trees) planting is appropriate.
**Suggested:** Plant in groupings where possible.

**Set-Backs**

Within the recommended 10 foot wide boulevards, trees should be set back a minimum distance of 4 feet. This allows some flexibility of placement within the

boulevard (e.g., different species of trees can be "centered" between 4 and 8 feet from the street curbing).

## B. Non-Tree boulevards (less than 8')

### Plant Size.

**Note:** We do not advise planting trees in boulevards that are under (8 feet) wide.

**Options:** Shrubs that are either under 30 inches tall or on a reasonable trimming cycle (no less than one year) that sustains 30 inches or less in height; or ornamental grasses/herbaceous plants that grow to less than 30 inches tall at maturity.

*No special consideration if over head lines are present.*

### Specimen vs Copse

Group planting will have the largest visual impact and will also be the most healthy.

## C. Tree boulevards (greater than 8')

### Plant Size

**Options:** Large Trees (over 60 ft.), Medium Trees (26 - 50 ft.), Small Trees (under 25 ft.), Shrubs (if setback from road sides and intersections).
**Suggested:** Large Trees (over 60 ft.) and Medium Trees (26 - 50 ft.)

***If over head lines are present:***
***Options:*** *Only plant trees with maximum expected heights that will not reach the height of the lowest overhead line.*

***Suggested:*** *The largest tree that will not reach the height of the overhead lines.*

***Examples:***
*High power lines (primary distribution lines) 45-50 feet high*
*use Medium Trees (26 - 50 ft.) or Small Trees (under 25 ft.)*
*Low power lines (20-25 feet) use Small Trees (under 25 ft.)*

### Specimen vs Copse

Both specimen and copse planting are appropriate.
**Suggested:** There may be limited locations for this but plant in grouping where possible.

## D. Median strips / rotaries / roundabouts

### Plant Size

**Note:** Where possible do not plant turf in these areas in order to minimize mower and trimmer damage.
**Options:** Large Trees (over 60 ft.), Medium Trees (26 - 50 ft.), Small Trees (under 25 ft.), Shrubs (if setback from road sides and intersections).
**Suggested:** Roundabouts: Use the entire range of plant sizes to create a mass of plantings with a large canopy size. Use large trees in the center, and smaller trees and shrubs on the outside. Also incorporate understory vegetation.
Median Strips: If sight lines from one lane to another are not needed, plant in a dense manner using large trees and shrubs or grasses below them.

***If over head lines are present:***
***Options:*** *Only plant trees who's maximum expected height will not reach the height of the lowest overhead line.*

***Suggested:*** *The largest tree that will not reach the height of the overhead lines.*

***Examples:***
*High power lines (primary distribution lines) 45-50 feet high*
*use Medium Trees (26 - 50 ft.) or Small Trees (under 25 ft.)*
*Low power lines (20-25 feet) use Small Trees (under 25 ft.)*

### Specimen vs Copse

Both specimen and copse planting is appropriate.
**Suggested:** Plant in grouping where possible.

## E. General provisions and notes:

### Design guidelines

General boulevard/street tree design guidelines are provided in *"The Road to a Thoughtful Street Tree Master Plan: A Practical Guide to Systematic Planning and Design."* The electronic version is accessible from the University of Minnesota Forest Resources Extension web site.

### Provision for existing trees (Canopy preservation)

Preservation of existing trees is of primary importance. Existing trees, if in acceptable health and condition take priority over new plantings and spacing should be adjusted accordingly.

**Traffic calming**
Reduce spacing near intersections to give an impression of a faster rate of speed to drivers which tends to reduce the speed of traffic.
*Example: If the typical spacing of trees on Maplewood's boulevards is 35 feet, plant trees 20-25 feet on center in areas where a slower traffic speed is desired. The rapid frequency of tree trunks has a psychological effect that causes the driver to feel that they are driving faster than they actually are.*

**Future Development**
Review planned widening projects and either plant trees knowing they will be removed (perhaps fast growing trees) or don't plant in areas of future development.

**Green Easements**
Green Easements have been used successfully in many communities notably Concord, MA.
The benefits of "Green Easements" include:

- Avoidance of utility conflicts
- Avoidance of confined planting space (2-3 foot wide boulevards)
- Avoidance of damage to hardscapes, such as curbing
- Better rooting area (more area and away from deicing salts)

**One Sided Skinny Sidewalks**
Advantages of "One Sided Skinny Sidewalks" over two sided sidewalks:

- Less run off
- Less maintenance
- Less tree root damage from construction

Placement Options:

- One sided skinny sidewalks should be placed a minimum of 8ft from the roadway to ensure a boulevard which can sustain large trees.
- Sidewalks should be placed directly next to the roadway.

## F. General Design Criteria Guidelines: Species Selection

It is recommended that species distribution and selection be accomplished by using plant selector software such as the Minnesota Department of Transportation's "Plant Selector," available on the Mn/DOT web site. Species should be selected based on the site criteria (e.g., proximity to deicing salt spray) and reviewed by the City's horticulturist and tree advisory board.

The development of lists of "acceptable" or "unacceptable" species is not recommended. Lists of these sorts are quickly outdated and tend to escape periodic revisions.

## RESOURCES

### Benefits of Boulevard Trees

**Social**
http://www.biology.duke.edu/wilson/EcoSysServices/papers/GreenAmongtheConcrete.pdf

**Economic**
http://greenvalues.cnt.org/green-infrastructure
http://nrs.fs.fed.us/pubs/rb/ne_rb166.pdf (Assessing Urban Forest Effects and Values, the Minneapolis Urban Forest)

### Site Analysis

**Testing Soil Compaction or Soil Compaction**
http://www.gemplers.com/tech/compaction.htm
http://www.multiquip.com/multiquip/pdfs/product-brochures/Soil-compaction-2004-handbook.pdf
http://soils.usda.gov/sqi/publications/files/sq_nin_1.pdf

**Testing for Soil Characteristics**
http://www.soils.umn.edu/academics/classes/soil2125/
http://www.soils.umn.edu/academics/classes/soil2125/doc/lecnots.htm
http://soils.usda.gov/sqi/assessment/files/bulk_density_sq_physical_indicator_sheet.pdf
http://soils.usda.gov/sqi/assessment/files/infiltration_sq_physical_indicator_sheet.pdf
http://soils.usda.gov/sqi/assessment/files/test_kit_complete.pdf
http://soils.usda.gov/sqi/assessment/test_kit.html
http://soils.usda.gov/use/urban/downloads/primer(for_printing).pdf
http://www.umass.edu/urbantree/mla.pdf
Urban, James. "Bringing Order to the Technical Dysfunction within the Urban Forest." Journal of Arboriculture 18(2) 1992: 85-90.

### Comprehensive Tree Resources

http://www.treecanada.ca/programs/urbanforestry/cufn/resources_bmp.html#_Toc126753321
http://cityofdavis.org/cmo/citycode/chapter.cfm?chapter=37
http://na.fs.fed.us/watershed/pdf/Urban%20Watershed%20Forestry%20Manual%20Part%203.pdf
http://www.umass.edu/urbantree/mla.pdf

**Sample Community Forestry Sites**
http://www.stlouispark.org/homeowners.htm#3410
http://www.ci.minnetonka.mn.us/public_works/natural_resources/forestry.cfm
http://ci.andover.mn.us/index.asp?Type=B_BASIC&SEC=%7BA3A7D0AC-B87E-43A5-9FB3-7BF7DA907722%7D&DE=%7BD725CF79-6AF8-4509-BB31-0A34312C0BCA%7D
http://www.ci.fergus-falls.mn.us/pdf/ParkPlan/AppendixB-ApprovedTreesFinal.pdf
http://www.ci.maple-grove.mn.us/filestorage/143/199/564/TreeSiteSelection.pdf

**Other community websites:**
http://www.stlouispark.org/homeowners.htm#3410
http://www.isa-arbor.com/publications/ordinance.aspx
http://www.ci.minnetonka.mn.us/public_works/natural_resources/forestry.cfm
http://www.ci.fergus-falls.mn.us/pdf/ParkPlan/AppendixB-ApprovedTreesFinal.pdf
http://ci.andover.mn.us/index.asp?Type=B_BASIC&SEC=%7BA3A7D0AC-B87E-43A5-9FB3-7BF7DA907722%7D&DE=%7BD725CF79-6AF8-4509-BB31-0A34312C0BCA%7D

**Design**

**Placement**
http://www.forestry.umn.edu/extension/urban_com/Street%20Tree%20Manual.REVISED_2008.pdf (or, type in Forest Resources Extension, go to the web site and click on The Road to a Thoughtful Street Tree Master Plan," under Hot Topics, left side column)
http://joa.isa-arbor.com/request.asp?JournalID=1&ArticleID=2609&Type=2
http://www.umass.edu/urbantree/mla.pdf

**Trees Near Power lines**
http://www.mnpower.com/treebook/tree/strplntg.gif
http://www.umass.edu/urbantree/mla.pdf
http://www.dec.ny.gov/lands/27731.html
http://selectree.calpoly.edu/utilityTree_zones.lasso
http://www.ci.fergus-falls.mn.us/pdf/ParkPlan/AppendixB-ApprovedTreesFinal.pdf

**Green Easements**
http://www.dfr.state.nc.us/Urban/urban_green_infrastructure.htm
http://greenvalues.cnt.org/green-infrastructure
http://extension.osu.edu/~news/story.php?id=3059
http://www.biology.duke.edu/wilson/EcoSysServices/papers/GreenAmongtheConcrete.pdf
http://www.usgbc.org/Docs/Archive/MediaArchive/703_Bunster-Ossa_PA355.pdf
http://www.dnr.state.mn.us/forestry/easement/easementrequirements.html

## Tree Selection

### General Tree Selection

http://dotapp7.dot.state.mn.us/plant/
http://www.ci.fergus-falls.mn.us/pdf/ParkPlan/AppendixB-ApprovedTreesFinal.pdf
http://www.stlouispark.org/webfiles/File/RECOMMENDED%20TREES%20FOR%20ST.pdf

### Dutch Elm Disease Resistant Elm

http://www.tre.umn.edu/current_research/elms/ElmsTwinCities-Guide.pdf
http://www.tre.umn.edu/current_research/elms/ElmsTwinCities-Table.pdf
http://www.extension.umn.edu/projects/yardandgarden/ygbriefs/p425dutchelm-resistant.html
http://www.extension.iastate.edu/Publications/SUL4.pdf

### Trees for High pH

http://www.ci.maple-grove.mn.us/filestorage/143/199/564/TreeSiteSelection.pdf
http://selectree.calpoly.edu/?-session=selectree:806549CF080f116E28nTH1E83E5F
http://selectree.calpoly.edu/attribute_search.lasso
http://joa.isa-arbor.com/request.asp?JournalID=1&ArticleID=2610&Type=2
http://www.sustland.umn.edu/maint/woody_maint.html
http://www.extension.umn.edu/distribution/naturalresources/DD7502.html

### Trees that tolerant to Deicing Salt

http://www.extension.umn.edu/distribution/naturalresources//DD1413.html
http://www.extension.umn.edu/distribution/naturalresources/DD7502.html
http://www.ci.fergus-falls.mn.us/pdf/ParkPlan/AppendixB-ApprovedTreesFinal.pdf
http://www.mnstac.org/STA/2003/MNSTAC_03_spring.pdf (not exact, overview of)
http://www.saltinstitute.org/content/download/480/2980
http://www.michigan.gov/documents/ch3-deice_51440_7.pdf

## Tree Care/Maintenance

### General Maintenance

"Tree Owner's Manual for Northeastern and Midwestern United States."
<http//na.fs.fed.us/pubs/uf/tom/090202_tom_hr.pdf.> Nov. 2008. 29

### Estimating Costs of Installation/Maintenance

The Landscape Data Manual, published by the California Landscape Contractors Association, Inc. 2021 N. Street, Suite 300, Sacramento, CA 95814. Type this title into any search engine for ordering. Multiple sources for purchase.

Kerr's Cost Data For Landscape Construction. Unit Prices for Site Development. Norman L. Dietrich, author. Type this title into any search engine for ordering information.

**Best Planting Practices**
http://www.mnstac.org/STA/1999/99spr.pdf
http://www.treehelp.com/howto/howto-plant-a-tree.asp
http://www.forestry.umn.edu/extension/urban_com/Planting/How%20To%20Plant%20a%20TreeFINAL.pdf
http://www.forestry.umn.edu/extension/urban_com/Planting.html
http://na.fs.fed.us/watershed/pdf/Urban%20Watershed%20Forestry%20Manual%20Part%203.pdf

**Best Pruning Practices**
http://www.mnstac.org/STA/1999/99spr.pdf
http://www.forestry.umn.edu/extension/urban_com/Pruning.html
http://www.na.fs.fed.us/spfo/pubs/howtos/ht_prune/prun001.htm
http://www.treecanada.ca/programs/urbanforestry/cufn/resources_bmp.html#_Toc126753337

**Mulching Trees & Shrubs**
http://www.mnstac.org/STA/1999/99spr.pdf
http://www.forestry.umn.edu/extension/urban_com/MulchingComposting.html
http://www.sustland.umn.edu/maint/evergreen.html#3a
http://www.utextension.utk.edu/publications/spfiles/SP617.pdf
http://www.sustland.umn.edu/implement/trees_turf.html
http://www.dnr.state.mn.us/treecare/woodchips/index.html
http://www.sustland.umn.edu/maint/mulching.html
http://shadetreeexpert.com/mulch.html

**Risk Assessment and Management**
Urban Tree Risk Management, published by the U.S. Forest Service.
http://www.na.fs.fed.us/spfo/pubs/uf/utrmm/
Minnesota Law and Trees
http://www.forestry.umn.edu/extension/urban_com/MinnesotaLawsAndTrees.html

## V. GLOSSARY

**Boulevard**: Loosely regarded as the "tree lawn." Public greenspace in the right of way that may or may not contain a sidewalk as the inside boundary of the boulevard.

**Defects**: Reference to tree condition that makes the tree or tree part more likely to fail. For example, weakly attached branches, root systems that have been cut.

**Green Easement**: The city-owned right of way in a residential front lawn that can be used for the placement of "street trees." Said trees are considered the property of the city unless otherwise stated.

**Hazard Trees:** Trees with defects that could cause damage to people or property (targets) if the defects caused a failure of the tree or tree parts.

**Percolation Rate:** A measure of the drainage rate of a landscape soils. An acceptable percolation rate for trees is a hole 24 inches deep filled with water will completely drain within 24 hours. If after 24 hours some level of water remains in the hole, the soil is termed poorly drained to some degree and the selection of plant material for that area must be limited to trees that perform well on poorly drained soils.

**Right of Way:** The city-owned portion of a residential lawn that allows the city to maintain its infrastructure such as buried utilities.

**Risk Management:** The development of a protocol for the regular monitoring and assessment of urban trees for their hazard potential, and the development of a prioritized management program to reduce the likelihood of damage due to tree hazards to an acceptable level of risk. Common management tactics include removal of low-hanging branches over sidewalks and tree preservation plans that restrict the degree of construction damage to existing trees.

**Sight Lines**: The area at intersections that must remain open and clear to observe on-coming traffic or pedestrians. Sight lines must be clear of tall vegetation, low tree branches, signage or any other public or private infrastructure.

**Urban Tree Program:** A comprehensive management program that includes but is not limited to: community tree design master plan, planting and selection guidelines, tree and urban forest health management policies, tree preservation plans and risk assessment and management plans.