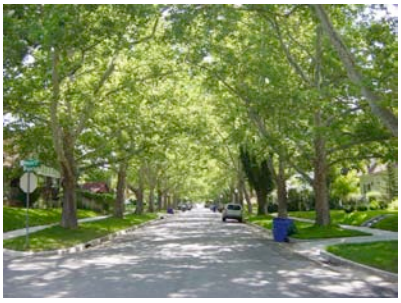
Develop specific objectives related data collection and recording

The development of these specific objectives will relate to various issues associated with data collection and recording. Urban forest data collection often relates to either inventory data (100% census) of trees along streets, in parks, or other urban areas; or a sampling of trees in these areas. Data collection can also be related to direct management issues (e.g., hazard assessments) or general assessments of species composition and ecosystem services. The objectives may vary depending upon the context.

Included in this DRAFT VER. 1.1 are the following standards

General Tree Metrics

Specific metrics on measurement of tree diameter, tree height, crown width, height to base of crown, species, species to cultivar or variety.



Tree Location and Site Variables

Tree location, including coordinates of tree and or address, city, country, general information on location in landscape (e.g., front yard, street tree, etc.), tree regeneration, plant and ground cover information soils information, and site constraints such as overhead wires, underground restrictions, planting width, available planting space and other site conditions.

Tree Maintenance

Standard metrics on maintenance needs such as structural support, pruning, removal, crown cleaning, crown raising, fertilization, aeration, pest management, follow-up inspection/monitoring, and other tree maintenance tasks.

The following standard criteria items are currently in development and will be available in late July.

Tree Health, Decay and Risk

Metrics on structural health including tree decay, failure type and specifics, tree hazard rating and other risk factors.

METRICS

The intent of the following text is to start writing down some variables for consideration by the General Tree Metrics sub-committee for review and comment. Please feel free to add other variables and comment on the proposed variables and text. Each variable is described based on the provided format for reporting each variable. Tree measures, as appropriate, would all be in English or metric units.

Variables:

- Species
- Diameter
- Height
- Height to base of live crown
- Crown width
- Crown light exposure
- Percent crown missing
- Crown dieback
- Proximity to buildings

Tree species

Why? – Species provides basic information on forest composition to aid in management and assessment of tree services. Required for understanding species richness and diversity, and for attributes related to species.

How? – Using dendrology skills to identify tree to genus, species or variety / cultivar. Based on identification skill and level of identification required, user can identify trees to genus, species and/or variety/cultivar as needed.

Units – Recorded as a standardized species code based on the plants database coding system (http://plants.usda.gov/). Limitations to plants database is that codes can change through time and species may be missing. The system is based on first two characters of a code being first two letters of the plant genus, 3rd and 4th characters being first letter of plant species (e.g., Acer platanoides is coded as ACPL). For duplicate codes, numbers are then used in the 5th and 6th code characters to differentiate (e.g., ACSA1, ASCA2). Cultivars could be added to the code in the 7th and 8th characters. A base list of fixed codes for over 10,000 species is available at: http://www.itreetools.org/resource_learning_center/history_and_links.shtm. This list could be used as a basis for developing an international urban forest species code list. The agreed upon codes in the standards should be posted to the standards website. New species could be added to the standard list by submitted the species and code to the standard's website for updating. Once a code is established for a species, the code will not change through time. Species names may changes and many names may be associated with one code as species names change through time. However, the species code should not change as changing codes would be antithetical to the standards process and would case all prior analyses to change codes. For example, Sapium sebifirum and Triadica sepifera are the same species with the species code TRSE6. If this species is renamed, the code would remain TRSE6.

Accuracy – No errors, 95% of the time

Tree sex

Why? –Provides basic information on related to fruit and litter production or allergens.

How? – Using dendrology skills to identify tree to identify sex of tree based on plant fruiting structures of dioecious species.

Units – M = Male
F = Female
X = Monoecious
U = Unknown

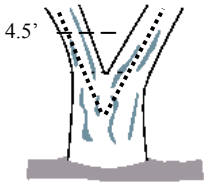
Accuracy – Accurate 95% of the time

Tree diameter

Why? – Simple measure used as a proxy for tree size and age. Data often required for estimates of tree biomass, carbon storage, tree appraisal, etc.

How? – Record diameter of tree at 4.5 ft (1.37 m) (DSH – diameter at standard height; also known as DBH - diameter at breast height) to the nearest 0.1 inch/cm. For trees with irregular DSHs or special cases:

Forked (multi-stemmed) tree: Measure the DBH of up to six stems separately. If the tree has more than six stems with DBH ≥1 inch, lower the measurement height to 1 ft above the ground and record the diameter of up to six stems (selecting the largest and ignoring any others).



Tree with irregularities at DBH: On trees with swellings, bumps, depressions, branches at DBH height, measure diameter as close to DSH as possible to represent diameter of tree if it had normal stem form.

Tree on slope: Measure diameter at 4.5 ft. from the ground along the bole on the uphill side of the tree from the original soil level or root crown (not from mulch or other amendments added on top of soil).

Leaning tree: Measure diameter at 4.5 ft. from the ground along the bole. The 4.5 ft. distance is measured along the underside face of the bole.

Live wind-thrown tree: Measure from the top of the root collar (original soil line) along the length to 4.5 ft. Measure diameter as close to DSH as possible to represent diameter of tree if it had not toppled over.

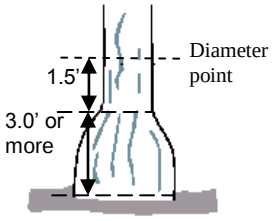


Figure D-1. Tree with swelled butt

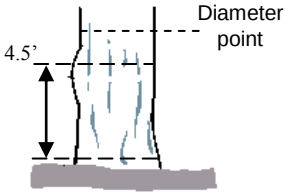


Figure D-2 Tree with swelling

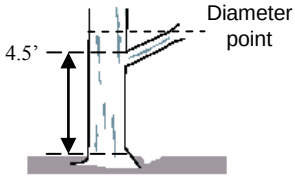


Figure D-3 Tree with branch

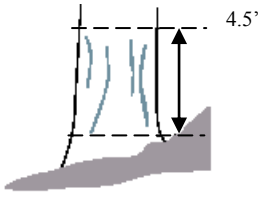


Figure D-4 Tree on a slope

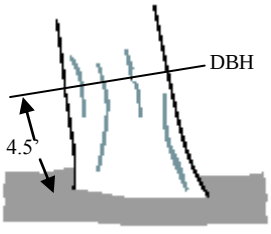


Figure D-5 Leaning tree

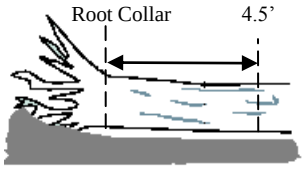


Figure D-6 Tree on the ground

DBH measurement height: If DBH was not measured at DSH (4.5 ft), measure the height where diameter was taken.

Units – diameter at breast height (4.5 ft; 1.37 m), measured in either in or cm, to the nearest 1/10th.

Accuracy – within 3%, 95% of the time

Total tree height

Why? – Necessary for estimating crown volume and leaf area, which are essential for estimating several ecosystem services. Tree height can also be used to gauge potential interference with urban infrastructure, estimating tree shade and solar obstruction, area within tree fall zone, etc.

How? – Measure the height to top (alive or dead) of tree. For dead trees, downed living trees, or severely leaning trees, height is considered the distance along the main stem from ground to tree top.

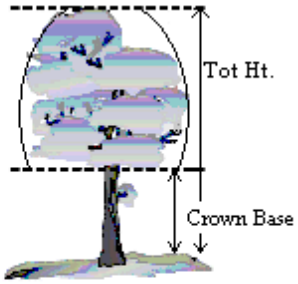
Units – Height to nearest foot or 10 cm

Accuracy – within 10%, 95% of the time

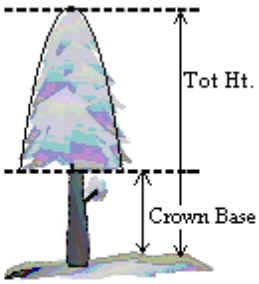
Height to base of live crown

Why? – Necessary for estimating crown volume and leaf area, which are essential for estimating several ecosystem services. Height to base of crown can be used to gauge potential interference with urban infrastructure and pedestrians, estimating tree shade and solar obstruction, etc.

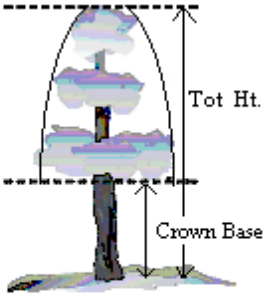
How? – Measure height to base of live crown. The live crown base is the point on the main trunk perpendicular to the lowest live foliage on the last branch that is included in the live crown. The live crown base is determined by the live foliage and not by the point where a branch intersects with the main bole. Many times there are additional individual sporadic live branches below the base of the crown. These branches can be excluded from the base of live crown measure if they have a basal diameter less than one–inch and are greater than 5 feet from the base of the obvious live crown.



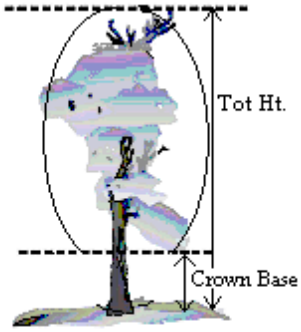
10% Canopy Missing



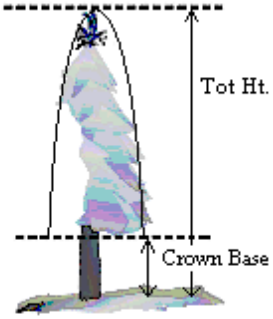
0% Canopy Missing



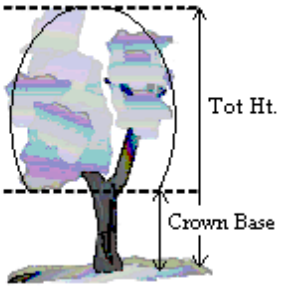
25% Canopy Missing



40% Canopy Missing



30% Canopy Missing



15% Canopy Missing

Units – Height to nearest foot or 10 cm

Accuracy – within 10%, 95% of the time

Crown diameter

Why? – Necessary for estimating crown volume and leaf area, which are essential for estimating several ecosystem services. Canopy width can also be used to gauge potential interference with urban infrastructure, estimating tree shade and solar obstruction, area within tree fall zone, canopy preservation specifications, etc.

How? – Measure crown diameter in two perpendicular directions: north-south and east-west or as safety considerations or physical obstructions allow. If tree is downed or leaning, take width measurements perpendicular to the tree bole.

Units – Width to nearest foot or 10 cm; recorded as average of 2 measurements

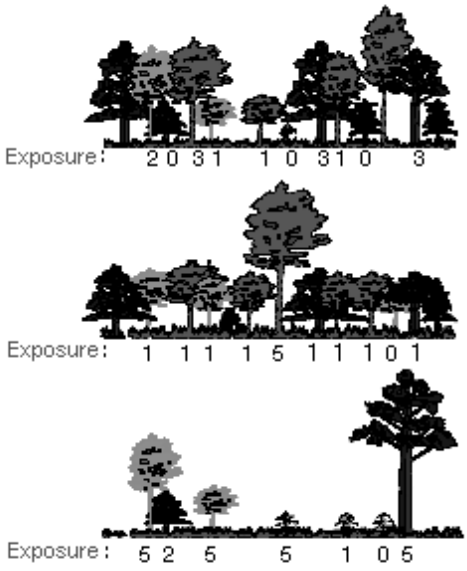
Accuracy – within 10%, 95% of the time

Crown light exposure

Why? – Used as an indication of crown competition and in estimating growth rates.

How? – record the number of sides of the tree receiving sunlight from above (maximum of five). Top of tree is counted as one side. Divide the crown vertically into four equal sides. Count the number of sides

that would receive direct light if the sun were directly above the tree. One-third of the live crown must be receiving full light in order for a side to qualify. A sliver of a side receiving light does not qualify.



Units – 0: The tree receives no full light because it is shaded by trees, vines, other vegetation, or urban infrastructure.

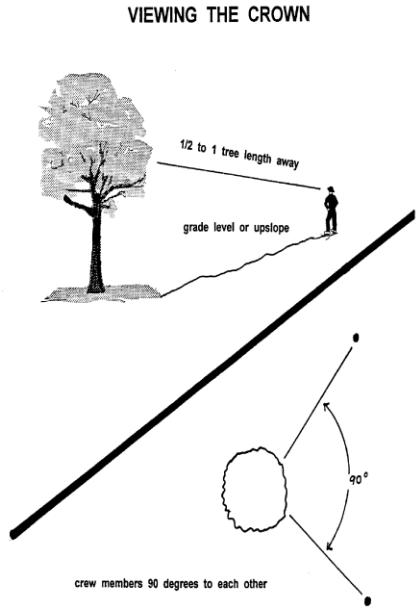
1: The tree receives full light from the top or 1 side.
2: The tree receives full light from the top and 1 side (or 2 sides without the top).
3: The tree receives full light from the top and 2 sides (or 3 sides without the top).
4: The tree receives full light from the top and 3 sides.
5: The tree receives full light from the top and 4 sides.

Accuracy – within 1 class, 95% of the time

Percent crown missing

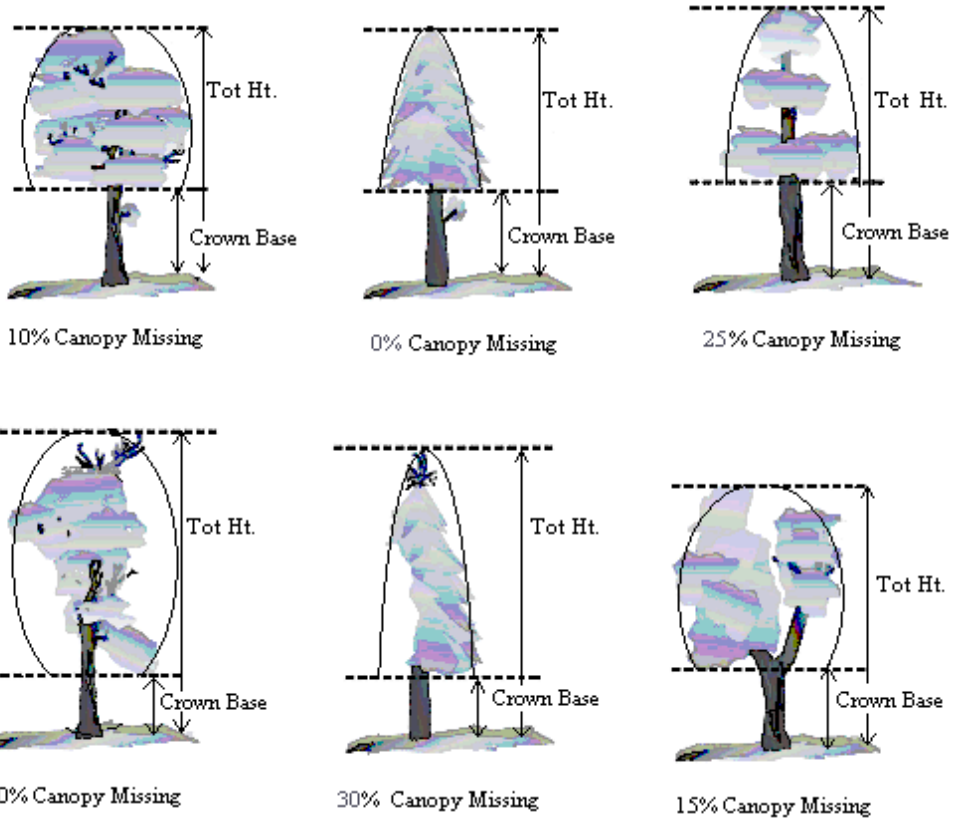
Why? – Necessary for estimating leaf area, which is essential for estimating several ecosystem services.

How? – Percent of the crown cross-sectional area that is not occupied by branches and leaves. Missing canopy should be measured by two people standing at perpendicular angles to the tree. Visualize the expected “typical crown outline” as a symmetrical silhouette created by the live crown width, total height, and height to base of live crown measurements. It is assumed to be symmetrical around the center point of the measured width of the tree and filled with leaves as if it were a healthy tree in excellent condition. Now estimate the percent foliage that is absent due to pruning, dieback, defoliation, uneven crown, or dwarf or sparse leaves. Do not include normal interior crown voids due to leaf shading. Take into account the natural crown shape for the particular species.



Be sure to base measurement on the existing crown that you have measured. For example, a third of the crown may have been removed for power line clearance or the canopy could be very

lopsided due to presence of a neighboring tree. Two recorders must come to concensus on percent missing category.



If the two observers disagree in their estimates, follow the guidelines listed below under Crown Rating Precautions.

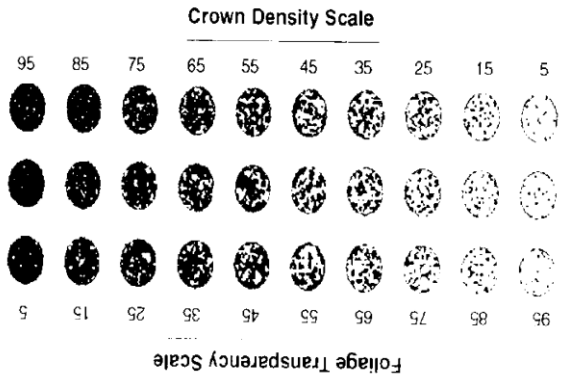
Crown Rating Precautions

Crews must be especially careful when making evaluations under certain conditions and follow the procedures below.

Distance from the tree: Attempt to stay at least 1/2 to 1 tree length from the tree being evaluated. Some ratings change with proximity to the tree. In some situations, it is impossible to satisfy this step, but do the best you can in each case. All evaluations are made at grade (same elevation as base of the tree) or up slope from the tree. This may not be possible in all cases but never get in the habit of evaluating trees from the down slope side.

View of the crown: Two crew members should stand at angles to each other to evaluate trees, striving to obtain the best view of the crown. The ideal positions are 90 degrees apart on flat terrain (Fig. 3). Don't evaluate the tree from the same position or at 180 degrees unless no other option exists. In heavily canopied areas, getting a good perspective of the crown becomes difficult. Overlapping branches, background trees, and lack of a good viewing area can cause problems when rating some trees. Crews need to move laterally to search for a good view. Take special care when rating such trees.

Climatic conditions: Cloudy or overcast skies, fog, rain, and poor sun angles may affect estimates. Crown diameters may be affected but to a lesser degree than other crown indicators. Crown dieback may be underestimated because it is difficult to see dead twigs or to differentiate defoliated twigs from dead twigs. Be especially careful during poor lighting conditions. Move around a tree to get another view, even if the view appears adequate at a specific location.



Heavy defoliation: During heavy defoliation, crown dieback may be overestimated. The use of binoculars may help in separating dead twigs from defoliated twigs.

Trees with epicormic branches or sprigs: Trees that are densely covered in epicormic sprouts are not considered special cases in field data collection. There are two methods for handling this situation. The first choice is not to consider epicormic sprouts as part of the live crown base (if located under the actual branches crown base). The foliage the epicormics do produce for the tree would be considered for the percent canopy missing, proportionately decreasing the amount of percent canopy missing.

EXAMPLE: A tree has epicormic sprouts extending to four feet from the ground, but its live crown base is measured at eight feet high. The crew estimates the percent canopy missing at 15%, but also estimates the additional four feet of epicormic sprouts to contain approximately 5% of canopy cover. The percent canopy missing would then be recorded as 10%. All of the percentages would be based on the crown measurements (crown widths, total height, and crown base height)

The second way would be to lower the crown base measurement to the lowest epicormic sprout, and then that point would be used to estimate the percent canopy missing of the tree. More times than not this method will increase the percent canopy missing.

Either way of handling epicormic branches will work with Eco, but in the field, it is helpful to be consistent. Use one method or the other for most, if not all, of the cases when encountering epicormic sprouts.

If a tree's canopy consists only of epicormic sprouts, or if they are located above the crown base, then they will be considered the canopy. Measure them as if they were the crown.

Resolving measurement differences: If the crown measurement estimates from two crew members do not match, arrive at the final value by:

- Taking an average, if the numbers differ by 10% (2 classes) or less.
- Changing positions, if the numbers differ by 15% or more and attempt to narrow the range to 10% or less.

• Averaging the two estimates for those trees that actually have different ratings from the two viewing areas (ratings of 30 and 70 would be recorded as 50)

Units – Record data within 5% categories:

0%
1-5%
6-10%
….
91-95%
96-99%
100%

Accuracy – with 1 category, 95% of the time

Crown dieback

Why? – An indication of tree condition/health used to estimate tree growth.

How? – Crown dieback is defined as recent mortality of branches with fine twigs, which begins at the terminal portion of a branch and proceeds toward the trunk. Dieback should occur from the top of the crown down and from the outside in toward the main stem. Dieback is only considered when it occurs in the upper and outer portions of the tree. When whole branches are dead in the upper crown, without obvious signs of damage such as breaks or animal injury, assume that the branches died from the terminal portion of the branch. Dead branches in the lower portion of the live crown are assumed to have died from competition and shading. Dead branches in the lower live crown are not considered as part of crown dieback, unless there is continuous dieback from the upper and outer crown down to those branches. **(**From: Forest Inventory and Analysis National Core Field Guide. Volume 1: Field Data Collection Procedures for Phase 2 Plots. Version 1.4).

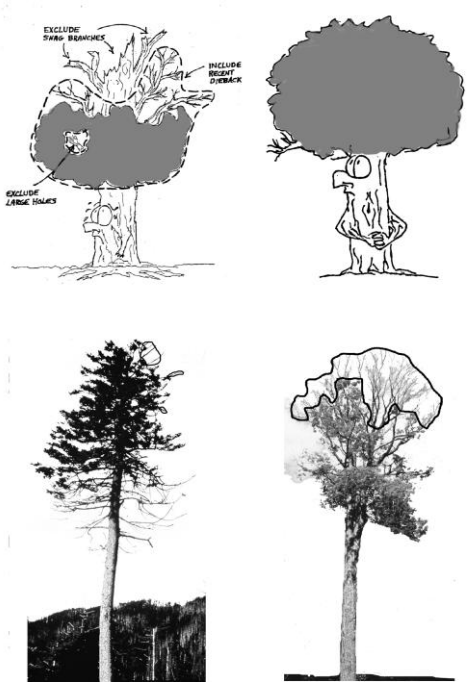


Figure F-1 Dieback rating examples.

This dieback does not include normal, natural branch dieback, i.e., self-pruning due to crown competition or shading in the lower portion of the crown. However, branch dieback on side(s) and top of crown area due to shading from a building or another tree would be included. For more information, see the Forest Inventory and Analysis National Core Field Guide.

Estimate crown dieback as a percentage of the live crown area, including the dieback area. Assume the perimeter of the crown is a two-dimensional outline from branch tip to branch tip, excluding snag branches and large holes or gaps in the crown. Crown dieback is obtained by two people using binoculars. You should be conscious of lighting conditions and how light affects the day's observations, taking extra time under limited-light conditions.

Each individual should mentally draw a two-dimensional crown outline, block in the dieback and estimate the dieback area. If the two observers disagree in their estimates, follow the guidelines listed above under Crown Rating Precautions.

Record data within 5% categories:

0%
1-5%
6-10%
….
91-95%
96-99%
100%

Accuracy – with 1 category, 95% of the time

Proximity to buildings

Why? – Required to assess effects on building energy use, view obstruction, potential utility conflicts, fall risk, etc.

How? – For trees that are located within 60 ft. of space-conditioned residential buildings that are three stories or fewer in height (two stories and an attic), record the direction and distance from the tree to the closest part of the building.

Units – Direction = azimuth in degrees; Distance to nearest foot or meter.

Accuracy – within 5 feet and 10 degrees, 95% of the time.

Conflicts with urban infrastructure (to be moved to maintenance text)

Why? – Required to understand potential conflicts with infrastructure (e.g., utilities).

How? – For trees that are have crowns that contact or in conflict with existing infrastructure, record the object type that is in conflict with the crown.

Units – class types:

- U – above ground utility wires and poles
- B – buildings
- F – fences
- S – street signs
- L – lighting
- T – vehicle or pedestrian traffic

Accuracy – within 1 object, 95% of the time.

TREE LOCATION

The intent of the following text is to begin compiling variables for consideration by the Tree Location sub-committee for review and comment. Please feel free to add other variables and comment on the proposed variables and text. Each variable is described based on the provided format for reporting each variable. Tree measures, as appropriate, would all be in English or metric units.

Variables:

- Tree ID Number
- Street Address or Parcel Number
- City or Municipality
- State, Province or Region
- GPS coordinates (X axis and Y axis)
- Placement within property
- Distance/azimuth to nearest structure

Tree ID Number

Why? - This number is individual for each tree inventoried, to allow for data searches of tree information.

How? – Assign a numeric value to each tree for which data is collected or recorded. Each value must be unique.

Units – Numeric

Accuracy – 100%

Street Address or Parcel Number

Why? - Necessary to determine the specific location that a variable was measured, collected or examined. Can also be used to assist with any follow up with property owners about trees inventoried

How? - Record the exact location for the specific property that the tree is located within. Can be a street address (123 First Street), or parcel number (Parcel 0001-2534-7894), or other designation that meets local requirements.

Units – Alpha-numeric designation for street address or parcel number

Accuracy – 100%

City or Municipality

Why? – Necessary for determining and documenting the country, or region, in which the data collection has occrued. Can also be used to

How? – Record the name of the city, municipality or township that pertains to the location of the data collection.

Units – Alphabetic text

Accuracy – 100%

State or Province or Region

Why? - Needed when doing inventory work for sampling in different regions where data may be combined for statistical or reporting or research purposes.

How? – Record the name of the state, province or region that pertains to the location of the data collection.

Units – Alphabetic text

Accuracy – 100%

GPS coordinates (X axis and Y axis)

Why? – To assist in returning to the particular location of the original data collection or study.

How? - These can be automatically input from the GPS unit being used as part of the inventory, or physically input from viewing GIS information from a map during field work or during office documentation work.

Units – Degrees, minutes and seconds (DDD, MM, SS) is the conventional method of presentation. (Latitude is DD while longitude is DDD.) There is usually a quadrasphere designation as well, such as N, S, E or W, based on the equator and the prime meridian. For the hemisphere, either North or South, the designation is N or S for latitude. East of the prime meridian is E (positive) and West of the prime meridian is W (negative). Negative numbers (in certain situations, Southern latitude is displayed as negative; if you see a negative latitude, it is South while a negative longitude is West) can also be used to express a quadrasphere designation. In this converter, we do neither since it does not matter. All numbers are assumed to be positive as far as entry and are actually determined by the N, S, E or W entry.

Accuracy – +/- 30 meters

Placement within property

Why? Necessary to assist in determining the overall location of a variable within as particular study site.

How? – Record the location on property using descriptive words (front yard, left side, right side, backyard, street swale, median island, etc.). Some inventories have a general quadrant diagram to use for properties (2-4 sections per side of property), so the Placement may be numerical instead of descriptive.

Units – Alpha-numeric

Accuracy – 100%

Distance/azimuth to nearest structure

Why? Necessary to determine the relative impact of other objects, structures and landscape features on a particular study site or variable.

How? - Measurement of distance from center of tree, or study object, to the nearest structure (house, building, natural feature, etc.), and the azimuth of that line.

Units – Distance in feet or meters. Azimuth in Degrees

Accuracy – Within 10%, 90% of the time

SITE VARIABLES

The intent of the following text is to begin compiling variables for consideration by the Site Variables sub-committee for review and comment. Please feel free to add other variables and comment on the proposed variables and text. Each variable is described based on the provided format for reporting each variable. Tree measures, as appropriate, would all be in English or metric units.

Variables:

- Land Use or Zoning Designation or Property Type
- Owner Type
- Property Condition
- Type of ground cover at base of tree
- Ground cover predominant under tree canopy
- Slope
- Aspect
- Site Disturbance
- Planting area
- Planting area width
- Root crown depth
- Barriers to access within tree canopy
- Distance from vehicular traffic
- Utilities present within tree canopy or root zone
- Soil information

Land Use or Zoning Designation or Property Type

Why? – Necessary for recording the type of land use for a property (residential, commercial, industrial, agricultural, rural, etc.). Can also be the zoning code designation for some inventory projects (R-1, C-1, R/I, etc.). This information is used for reporting and research work.

How? – Record the local land use designation or property type for the site on which data collection occurs.

Units- Alpha-numeric variables

Accuracy – 100%

Owner Type

Why? – Necessary to establish the primary owner of the study site in case of trespass, injury or jurisdiction issues.

How? – Record the name, category or type of owner for the property (Federal, State, County or Province, Municipal or City or Parish, Private, Communal/cooperative (private, but group ownership), etc.).

Unit – Alphabetic text

Accuracy – 75%, 75% of the time.

Property Condition-

Why? – Necessary for recording a description of the condition of the property related to intensity of maintenance or management of a survey site. This is useful for follow up about maintenance needs or property owner contact.

How? – Visually survey the study site and provide an representative rating to the overall landscape maintenance that has occurred on the property.

Units – Record the condition using the following criteria: “Maintained” or “Unmaintained”.

Accuracy – 75%

Ground cover at base of tree

Why? – Necessary to help assist in the determination of the overall health, vigor and response of the tree to physical and physiological stresses.

How? – Record the representative type of ground cover that is immediately adjacent to the trunk of the tree.

Units – Bare soil, organic mulch, turf grass, perennial plants or annual plants.

Accuracy – Within 15%, 90% of the time.

Ground cover predominant under tree canopy

Why? – Necessary to help assist in the determination of the overall health, vigor and response of the tree to physical and physiological stresses.

How? – Record the representative type of ground cover that is under the dripline of the tree.

Units – Bare soil, organic mulch, turf grass, perennial plants or annual plants.

Accuracy – Within 15%, 90% of the time.

Slope

Why? Necessary to determine the grade of the area under the canopy of the tree, which can help determine surface water flow, maintenance issues and other physical or physiological stresses or benefits provided by changes in the grade and elevation.

How? – Determine an estimate of the grade around a tree up to the drip-line of the canopy.

Units – Degrees

Accuracy – within 10%, 90% of the time

Aspect

Why? Necessary to determine the solar receipt of the tree, as well as establish potential impacts of exposure, wind and related weather events on the tree's health and vigor.

How? – Determine an estimate of the angle of a tree as it related to the horizon.

Units – Degrees.

Accuracy – within 10%, 90% of the time.

Site Disturbance

Why? – Necessary to determine the level and/or likelihood of impacts on the tree from changes to the areas immediately surrounding the tree's growing location.

How? – Record any signs of recent site disturbance should be indicated (recent construction, storm damage, erosion, site clearing, deforestation, etc.)

Units – Alphabetic

Accuracy – 75%, 75% of the time

Planting area

Why? – Necessary to determine the potential impact of physical growing conditions in the area in which the tree is established..

How? – Record a description for the area that the tree is located within (grass strip, sidewalk cutout, parking island, median, front yard, open field, forest, park, etc.).

Units – Alphabetic text

Accuracy – 75%, 75% of the time

Planting area width

Why? –Necessary to determine the potential impact of physical conditions in the area in which the tree is growing, in roadside or linear planting site. Also, this is important for determining sustainable trees for future plantings and designating existing trees for root zone limitations.

How? – Record width of planning area surrounding a tree (median width, swale width, front yard width, sidewalk cutout width, etc.) that is made up of permeable material.

Units – Feet or meters

Accuracy – 90%, 95% of the time

Root crown depth

Why? – Used for management decisions and future tree health considerations. [

How? – The location of the root crown as considered against the grade or ground level (below, even, above ground surface).

Units – Inches or centimeters

Accuracy – 90%, 95% of the time

Barriers to access within tree canopy

Why? – Necessary to provide protection against pedestrians, vehicles, etc. entering root zone within tree canopy area.

How? – Determine the type of barrier recommended for tree protection, such as a perimeter fence, cautionary signage, curbing, etc.).

Units – Alphabetic text

Accuracy – 100%

Distance from vehicular traffic

Why? – Necessary to provide guidance related to protecting the root zone from compaction and the tree crown and trunk from physical injury by vehicular traffic.

How? – Determine distance from center of the tree to nearest vehicular travel or parking lane.

Units – Feet or meters.

Accuracy – within 90%, 95% of time.

Utilities present within tree canopy or root zone

Why? – Necessary to provide an understanding of potential impacts of utility systems to tree growth.

How? – Determine type of utility that is impacting the tree canopy or root zone (i.e.: overhead electric, overhead cable TV, overhead telephone, underground water, underground gas, underground electric, etc.).

Units – Alphabetic text

Accuracy – within 90%, 95% of time.

Soil information

Why? – Necessary to determine the structure, type, Ph level and quality of soil in which a tree is growing.

How? – Determine the predominant structure, type, Ph level and quality of the soil in the root zone of a tree.

Units – Alpha-numeric

Accuracy – within 80%, 90% of time.

MAINTENANCE

The intent of the following text is to begin compiling variables for consideration by the Tree Maintenance sub-committee for review and comment. Please feel free to add other variables and comment on the proposed variables and text. Each variable is described based on the provided format for reporting each variable. Tree measures, as appropriate, would all be in English or metric units. All variables noted will follow A300 ANSI compliance standards as appropriate.

Variables:

- Pruning Type
- Utility Pruning
- Transplanting
- Mulching
- Support Systems
- Lightening Protection
- Root Barrier
- Stem Girdling Roots
- Wood Utilization
- Irrigation
- Fertilization

Pruning Type

Why? – Necessary for determining the need for safety, structural or aesthetic pruning of a tree.

How? – Determine the category of pruning needing needed on a tree.

Units – Class Types
RA - Raise
CL - Clean
ST – Structural
TH – Thin
RD – Reduce
VI - Vista

Accuracy – within 80%, 90% of the time

Utility Pruning

Why? – Necessary for determining the need for pruning necessary for the safe and reliable delivery of electric, telephone, cable, and other overhead utilities to residential and commercial customers.

How? – Determine the necessity of utility pruning of a tree within one-year of inspection.

Units – Yes or No

Accuracy – within 80%, 90% of the time

Transplanting

Why? – Necessary for determining the process for transplanting an existing tree to another location.

How? – Determine the recommended type of transplanting appropriate for the tree.

Units – class types:

BB - Balled and wrapped: Plants established in the ground that have been prepared for transplanting by digging so that the soil immediately around the roots remains undisturbed. The ball of earth containing the roots of the plant is then bound up.

BR - Bare root: Harvested plants from which the soil or growing medium has been removed.

BX - Boxed: A method for protecting roots that includes digging a trench, constructing and installing a box around the roots, and then using the box to lift, transport, and install the landscape plant.

TS - Tree spade: Equipment used to transplant large trees.

Accuracy – 100%

Mulching

Why? – Necessary for determining the need for mulching to improve the overall health of a tree.

How? – Determine the recommendation of mulch over the root zone of a tree.

Units – Yes or No

Accuracy – within 80%, 90% of the time

Support Systems

Why? – Necessary for determining the need for structural support of a tree or tree parts.

How? – Examine the tree and recommend appropriate tree support system as applicable.

Units – class types:
ST - Stake
GY - Guy
CB - Cable
BR – Brace
PR – Prop

Accuracy – within 80%, 90% of the time

Lightening Protection

Why? – Necessary for determining the need for mulching lightening protection in a tree.

How? – Determine the exposure, aspect, elevation, potential risk and weather conditions near the tree.

Units – Class types:
Yes
No
Update

Accuracy – within 90%, 90% of the time

Root Barrier

Why? – Necessary for determining the need for a root barrier to control growth of underground tree roots.

How? – Examine nearby infrastructure and elements that may affect the growth and survival of tree roots.

Units – Yes or No

Accuracy – within 90%, 90% of the time

Stem Girdling Roots

Why? – Necessary for determining the occurrence of stem girdling roots near the soil surface.

How? – Visually examine, or excavate with air tools, the root area at the base of the tree and determine the occurrence of stem girdling roots that are visible.

Units – Yes or No

Accuracy – within 90%, 90% of the time

Wood Utilization

Why? – Necessary for determining the use of a tree for wood-products industry

How? – Examine the tree and recommend appropriate use of harvested components

Units – class types:
WC - Wood chips
FW - Firewood
LM - Lumber
VN – Veneer

Accuracy – within 80%, 90% of the time

Irrigation

Why? – Necessary for determining the potential value of irrigation on a particular tree.

How? – Examine the growing site, including, soil, root zone, aspect, and growing conditions and recommend irrigation installation.

Units – class types:
NA- Not needed at this time
DR – Drip irrigation
SP – Spray irrigation

Accuracy – within 95%, 90% of the time

Fertilization

Why? – Necessary for recommending the addition of nutrients to improve tree health.

How? – Perform a complete soil analysis/test including structure, PH, nutrient levels and organic composition.

Units – variable as per specific test.

Accuracy – within 95%, 95% of the time