



United States  
Department  
of  
Agriculture

Forest  
Service

Pacific  
Southwest  
Research  
Station

Center for Urban Forest Research  
c/o Environmental Horticulture  
RmOne Shields Ave. 1103, UC Davis  
Davis, California 95616  
Phone (530) 752-7636  
Fax (530) 752-6634



---

## REFERENCE CITY FIELD DATA COLLECTION PROTOCOLS

The following data will be recorded for each tree (note: fields 1-9, 11, 35 and 36 are provided by cooperating municipality):

- 1) Zone – from inventory, the number of the management area or zone that the tree is located in within a city.
- 2) TreeID – from inventory, unique number assigned to each tree by city in inventory.
- 3) SpCode – 4 to 6 letter code consisting of the first two letters of the genus name and the first two letters of the species name followed by two optional letters to distinguish two species with the same four-letter code.
- 4) AddressNum – from inventory, street number of building where tree is located.
- 5) Street – from inventory, the name of the street the tree is located on – from inventory.
- 6) Side – from inventory, indicates side of building or lot tree is located on (see Figure 1):
  - F = Front
  - M = median
  - S= side
  - P = park
- 7) Cell – from inventory, the cell number where the tree is located (1,2,3, etc). Obtain city inventory protocols to determine what order the trees are numbered in (e.g., sometimes they are assigned in driving direction or, alternatively, as street number increases, depending upon city).

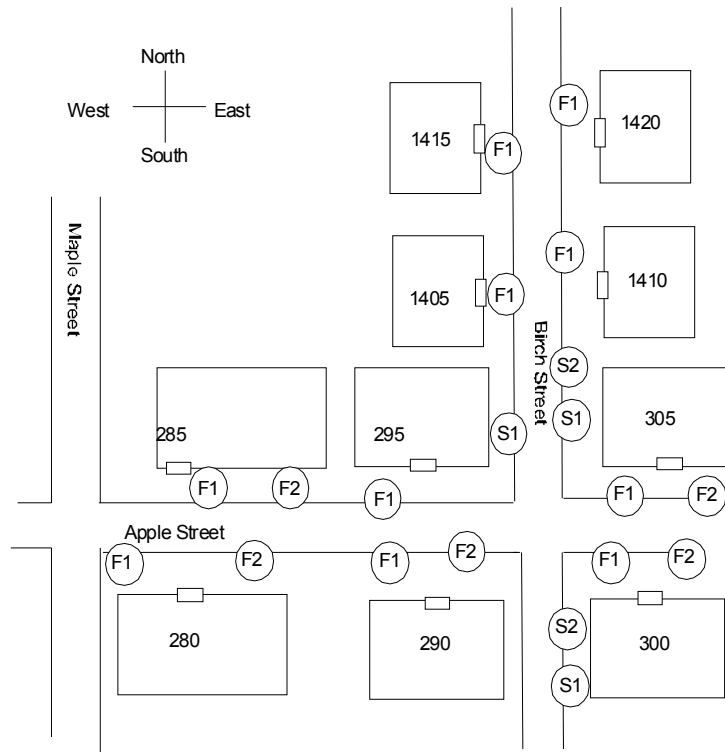


Figure 1. Treeloc tree 295 Apple S1 is actually the first tree (in driving direction) on Birch Street side of house

- 8) Onstreet – from inventory (omit if not included as a field in city’s inventory), for trees at corner addresses when tree is actually on cross street rather than the addressed street (see Figure 1).
- 9) FromTo – from inventory, the names of the cross streets that form boundaries for trees lining un-addressed boulevards. For example, on boulevards that have no development adjacent to them, therefore no obvious parcel addressing, trees are typically numbered in order. By including closest cross streets in the inventory, one will not have to begin counting trees from #1 in order to locate #333 which is 10 blocks up the boulevard from #1.
- 10) DBH – measure the diameter at breast height (1.37m) to nearest 0.1 cm (tape). Where possible for multi-stemmed trees forking below 1.37 m measure above the butt flare and below the point where the stem begins forking. When this is not possible, measure DRC as described below. Saplings (DBH/DRC 2.54 - 12.5 cm) will be measured at 1.37 m unless



## falling under multi-stemmed/unusual stem categories requiring DRC measurements (per FHM Field Methods Guide).

DIAMETER AT ROOT COLLAR (DRC) – adapted from FHM Field Methods Guide:

For species requiring diameter at the root collar, measure the diameter at the ground line or at the stem root collar, whichever is higher. For these trees, treat clumps of stems having a unified crown and common rootstock as a single tree; examples include mesquite, juniper, and mountain mahogany. For multi-stemmed trees, compute and record a cumulative DRC (see below); record individual stem diameters and a stem status (live or dead) on a separate form or menu as required.

Measuring DRC: Before measuring DRC, remove the loose material on the ground (e.g., litter) but not mineral soil. Measure just above any swells present, and in a location so that the diameter measurements are reflective of the volume above the stems (especially when trees are extremely deformed at the base).

Stems must be at least 1.0 ft in length and 1.0 inch in diameter to qualify for measurement; stems that are missing due to cutting or damage are not included in measurement

Additional instructions for DRC measurements are illustrated in Figure 2.

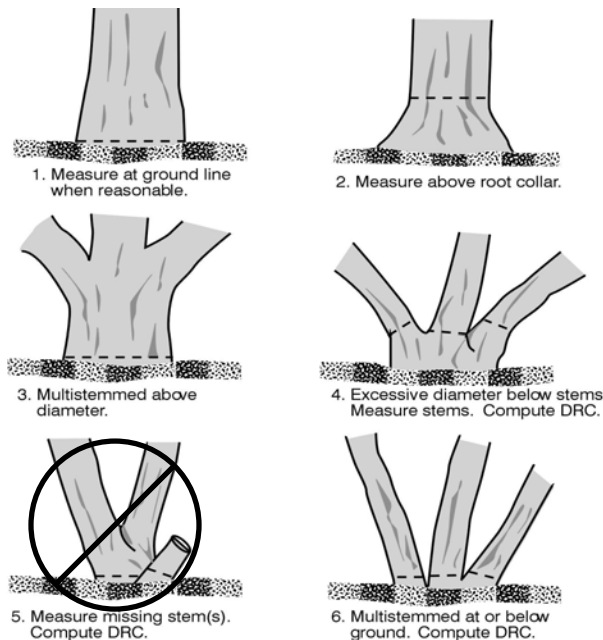
Computing and Recording DRC: For all tally trees requiring DRC, with at least one stem 1.0 inch in diameter or larger at the root collar, DRC is computed as the square root of the sum of the squared stem diameters. For a single-stemmed DRC tree, the computed DRC is equal to the single diameter measured.

Use the following formula to compute DRC:

$$\text{DRC} = \text{SQRT} [\text{SUM} (\text{stem diameter}^2)]$$

Round the result to the nearest 0.1 in. For example, a multi-stemmed woodland tree with stems of 12.2, 13.2, 3.8, and 22.1 would be calculated as:

$$\begin{aligned} \text{DRC} &= \text{SQRT} (12.2^2 + 13.2^2 + 3.8^2 + 22.1^2) \\ &= \text{SQRT} (825.93) \\ &= 28.74 \\ &= 28.7 \end{aligned}$$



**Figure 2.** How to measure DRC in a variety of situations.



- 11) DBHinv – the DBH from the city inventory, usually expressed as classes from 1 to 9, but class system specific to city. Sometimes expressed as DBH to nearest inch.
- 12) GroPerp = measurement of planting space perpendicular to street to closest 0.1 m. Enter NA for unrestricted rooting areas like parks, vacant lots, schools, institutions, and front yards where at least one side of tree crown does not intersect hardscape (see Fig. 4).
- 13) GroPar = measurement of planting space parallel to street to closest 0.1 m. when growing space is cutout or other location where there is no place for roots to break out into larger rooting area (e.g., lawn area, or large empty lot with soil). If area under drip line does not intersect hardscape, record as NA (see Fig. 4).

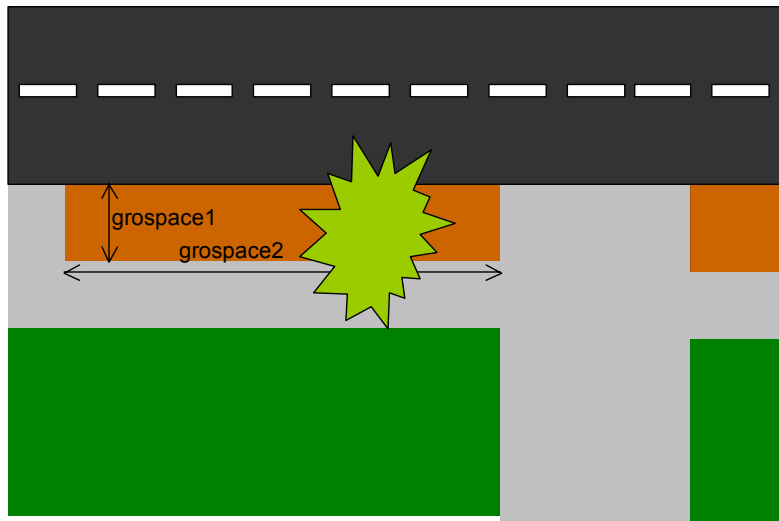


Figure 4. GroSpace 2 for this tree would be recorded as NA because crown width (parallel to road) does not intersect hardscape.

- 14) CrnDiaPar- (crown diameter) crown diameter measurement taken to the nearest 0.5 m parallel to the street. The occasional erratic branch should not be included (see Fig 5).
- 15) CrnDiaPerp- (crown diameter) crown diameter measurement taken to the nearest 0.5 m perpendicular to street. The occasional erratic branch should not be included (see Fig 5).

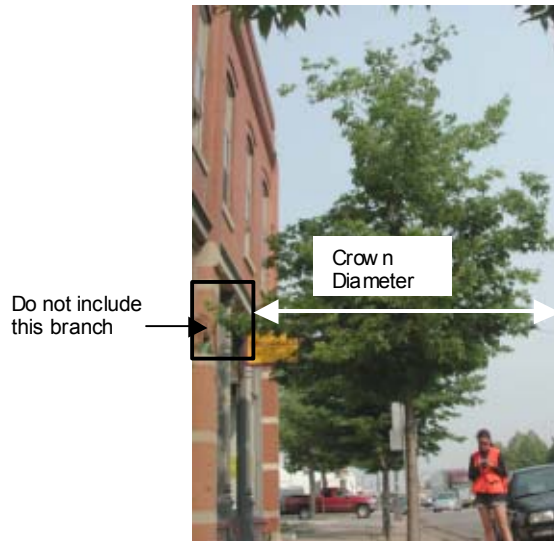


Figure 5. Erratic branch (in box at left) is omitted from crown diameter measurement. Distance measured is represented by white line.

- 16) Setback – distance from tree to nearest air-conditioned/heated space (be aware that this may not be same address as tree location).

Evaluate as:

- 1 = 0-8 m
- 2 = 8.1-12 m
- 3 = 12.1-18 m
- 4 = >18 m

- 17) MtnRec – the recommended maintenance for the tree:

- 0 = none
- 1 = young tree (routine)
- 2 = young tree (immediate)
- 3 = mature tree (routine)
- 4 = mature tree (immediate)
- 5 = critical concern (public safety)

- 18) MtnTask – maintenance task -- the highest priority task to perform on the tree:

- 1 = stake/train
- 2 = clean
- 3 = raise
- 4 = reduce
- 5 = remove
- 6 = treat pest/disease



- 19) TreeOr – Tree Orientation – taken with compass, as in Figure 7, the coordinate of tree taken from imaginary lines extending from walls of the nearest conditioned space (heated or air-conditioned space—may not be same address as tree location):

- 1 = N = North (337.5-22.5°)
- 2 = NE = Northeast (22.5-67.5°)
- 3 = E = East (67.5-112.5°)
- 4 = SE = Southeast (112.5-157.5°)
- 5 = S = South (157.5-202.5°)
- 6 = SW = Southwest (202.5-247.5°)
- 7 = W = West (247.5-292.5°)
- 8 = NW = Northwest (292.5-337.5°)

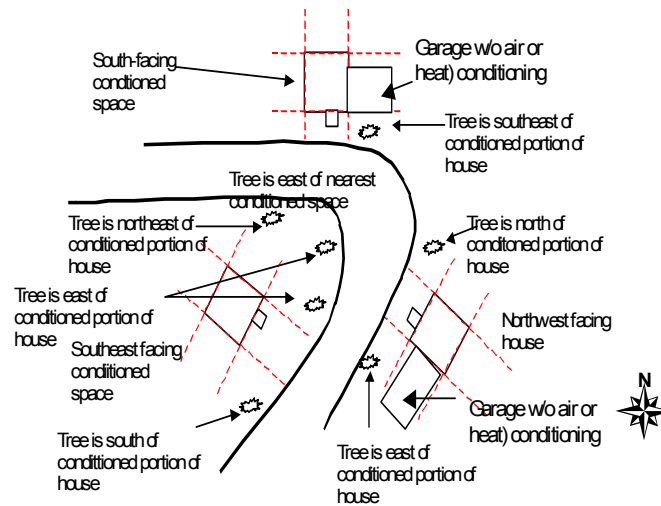


Figure 7. Shows imaginary lines extending from walls and associated tree orientation.

- 20) CarShade – Number of autos where any portion of any parked automotive vehicle is under the tree’s drip line. Car must be present:
- 0 = no autos
  - 1 = 1 auto
  - 2 = 2 autos, etc...
- 21) Image1 – select position for best possible photo of tree crown, keeping in mind that you must try to obtain two perpendicular views of the tree that are as free of background noise as possible. Try to position yourself so the tree crown is as isolated as possible from neighboring tree crowns and other crowns in background:
- a. distance from tree that photo is taken at increments of 5 m (5,10,15, 20 meters, etc) and accurate within 0.05 m.
  - b. camera zoom should be set to full wide angle



- c. first image must include entire tree (bole and crown) for backup measurements and should fill as much of viewfinder as possible
  - d. kneel to take images so more sky is included in background
- 22) Dist1 – Measure distance from camera back (the point where image is actually recorded) to point equivalent to center of tree bole (Figure 8). Measure accurately within 0.05 meter.

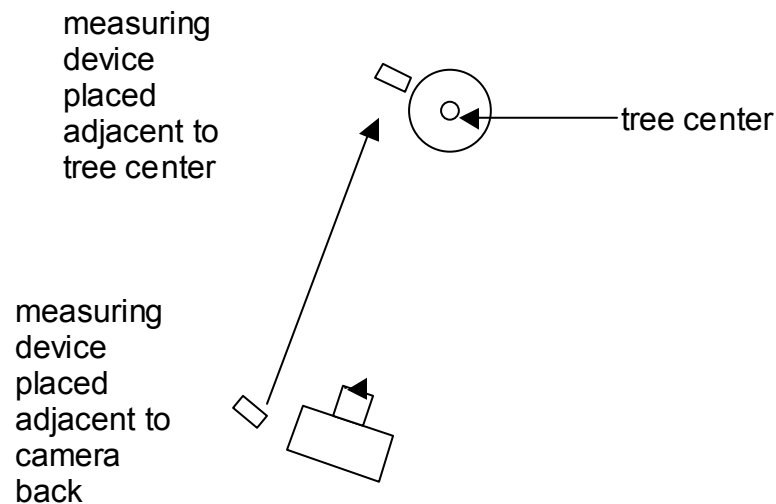


Figure 8. Showing how to measure distance (in 5 m increments) between camera back and tree center).

- 23) Image2 – taken as perpendicularly (90°) as possible to Image 1 (#21).
- 24) Dist2 – distance as per #22 for Image 2.
- 25) LandUse – Area where tree is growing:
- 1 = single family residential
  - 2 = multi-family residential (duplex, apartments, condos)
  - 3 = industrial/institutional/large commercial (schools, gov't, hospitals)
  - 4 = vacant/other (agric., unmanaged riparian areas of greenbelts)
  - 5 = small commercial
- 26) LocSite – location type:
- 1 = Front yard
  - 2 = Planting strip
  - 3 = Cutout (tree root growth restricted on all four sides by hardscape within dripline)



- 4 = Median
- 5 = Other maintained locations
- 6 = Other un-maintained locations
- 7 = Backyard

- 27) TreeHt – from ground level to tree top to nearest 0.5m (omit erratic leader as shown in Fig. 9) with range pole, altimeter or clinometer.

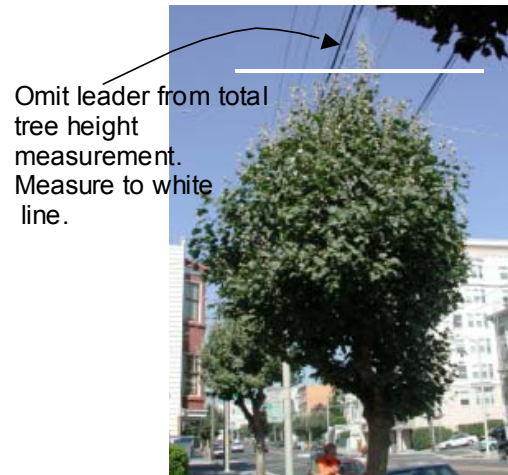


Figure 9. Tree with erratic leader that should not be included in height measurement.

- 28) CrnBase – with altimeter, average distance between ground and lowest foliage layer (omitting erratic branch) to nearest 0.5m.
- 29) BoleHt – with altimeter, distance between ground and location at bole where first set of branches connect. This is generally higher up the bole than the crnbase measurement.
- 30) Shape – visual estimate of crown shape verified from each side with actual measured dimensions of crown height and average crown diameter (See Figure 10):
- 1 = cylinder = maintains same crown diameter in top and bottom thirds of tree
  - 2 = ellipsoid (horizontal or vertical; also includes spherical) – for ellipse the tree's center (whether vertical or horizontal) should be the widest)
  - 3 = paraboloid – widest in bottom third of crown
  - 4 = upside down paraboloid – widest in top third of crown



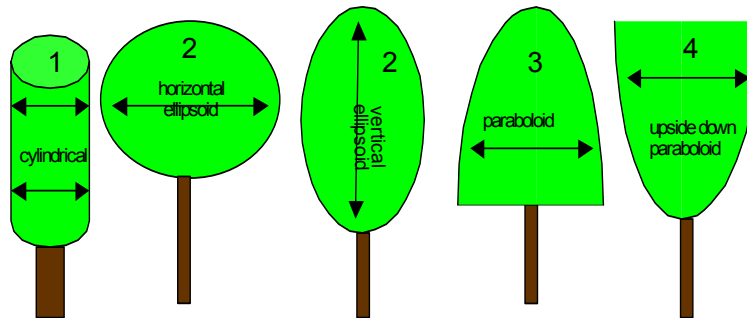


Figure 10. Shapes of trees.

- 31) WireConflict – utility lines that interfere with or appear above tree
- 0 = no lines
  - 1 = present and no potential conflict
  - 2 = present and conflicting
  - 3 = present and potential for conflicting
- 32) SwDamg – sidewalk damage categories will be determined for each city during study preparation. City forester will be asked 1) dimensional measurement at which sidewalk is heaved enough to grind or ramp and 2) at what degree of damage does city move from temporary to permanent repair. Example:
- 0 = None = heaved <1.90 cm (3/4 inch) = no repair
  - 1 = Low = heaved 1.90 to 3.8cm (3/4-1.5 inch) = ramp/grind
  - 2 = Medium = heaved 3.8 to 7.6 cm (1.5 - 3 inch) = replace/permanent repair
  - 3 = High = Heaved >7.6 cm (3 inch) = removal and replacement
- Note: Be careful NOT to assess damage adjacent to newly planted trees as damage associated with that tree.
- 33) CondWood – Structural (woody) health of tree as per adaptation of CTLA tree appraisal:
- 4 = No apparent problems = Good
  - 3 = Minor problems = Fair
  - 2 = Major problems = Poor
  - 1 = Extreme problems = Dead/dying
- 34) CondLvs – Structural (foliage) health of tree as per adaptation of CTLA tree appraisal:
- 4 = No apparent problems = Good
  - 3 = Minor problems = Fair
  - 2 = Major problems = Poor



---

1 = Extreme problems = Dead/dying

- 35) PlantDate – Date tree was planted (for data analysis, assumptions of age at planting will be obtained from city forester for 1.5” caliper trees).
- remind city forester to record planting date, not tree age.  
Cooperating municipality should provide info on typical age for each species at planting.
  - Provide city with list of trees to be aged—list should be sorted for aging by management area, street, and address (in this order) to simplify locating them
  - You should convert DBH (metric) into DBH (inches) for the city’s use
- 36) Accuracy – accuracy of tree age; when trees are being aged by city:
- Forester should then specify accuracy of estimated planting date using classes:
    - 1 = within a year
    - 2 = within 2-3 years
    - 3 = within 4-5 years
    - 4 = within 6-10 years
    - 5 = over 10 years.
- 37) Notes: any pertinent notes that help explain something that is unusual about the tree that may affect growth of the tree.
- 38) dbh1, dbh2, dbh 3, etc., are for individual stem diameter entries for multi-stemmed trees being recorded using DRC methods. These cells are linked to the formula in field #10 (DBH) column calculating the final DBH.