

## Sacramento Municipal Utility District

# Shade Trees: Tree Benefits Estimator

This application presents a Web based method for estimating the amount of energy savings (KWh saved), capacity savings (KW saved) and carbon and CO2 sequestration (lbs) resulting from MATURE trees planted individually in urban and suburban settings.

The simplified [Tree Benefit Estimator](#)© has been developed by Sacramento Municipal Utility District (SMUD) and it was based on the experience of the SMUD's Shade Tree program. The Tree Benefit Estimator can be used by those who have no formal background in urban forestry or Demand Side Management (DSM) utility practices. In developing this simplified and easy-to-use method for estimating the tree planting benefits, broad assumptions have been made regarding trees impact on direct shading benefits, impacts of indirect or evapotranspiration effect, heating penalty in winter months, tree growth rates and tree survival rates.

As a result, this method may yield less precise results than a more tailored approach, which may take into account the unique characteristics of the tree planting site. In order to convert the annual KWh saving estimates into monetary values, SMUD residential customers could simply multiply the KWh saving estimates with 10 cents, which would represent only a quick and easy approximation of SMUD summer average KWh price.

To use this method, you need to know the following:

1. the tree species,
2. the cardinal (compass) orientation of the tree,
3. the distance between the tree and the building that is being shaded and
4. the age of the tree from the tree planting date

To take into account different climate zones, you will need to input information on whether the utility has a substantial summer cooling load (which would then estimate 100% of the energy and capacity benefits), or small summer cooling load (which would then estimate 50% of the energy and capacity benefits) or no summer cooling load (which would then provide no energy and capacity benefits). However, regardless of whether a utility has any summer cooling load, the method will estimate carbon and CO2 sequestration values for the specified tree species. If the tree species is not on the list, then please select another tree species that is on the list and that has a similar tree size. All of the Estimated estimates of the energy savings (KWh saved), the capacity savings (KW saved) and the carbon and CO2 sequestration (lbs) savings are based on mature trees.

The methodology is based on the "standard" nursery raised trees which are typically sold in 5-gallon containers, and which are usually 1 inch in diameter at the tree base (1 foot above the ground). (SMUD Shade Tree program has experienced that 5-gallon container trees will grow quickly and catch up with the larger 15-gallon container trees within the next couple years and thus the methodology applies for both 5- and 15-gallon container trees.) This methodology assumes that the standard (5 gallon) trees are "0" age when planted.

The age of the tree from the planting date (from 1 to 30 years) will then determine the tree growth rate factor and the tree survival rate factor, which will then determine together the level of benefits for any year between 1 and 30. In other words, the combination of the tree growth rate and the tree survival rate will determine the final multiplier factor that will estimate the appropriate level of tree benefits for any year.

In order to estimate tree benefits for any tree age (between age 1 to 30 years), you will need to multiply the energy, capacity and carbon sequestration benefit values of MATURE trees with the appropriate Tree Growth and Survival Rate FACTOR. That additional estimate feature is also provided.

In the event you have any questions and need any additional information about the methodology, please contact via [e-mail](#) the SMUD staff who was responsible for designing the [Tree Benefit Estimator©](#).