GARDENING SERIES
Colorado MASTER GARDENER

# Tree Placement: Right Plant, Right Place 7.831

*by D. Whiting, J. Bousselot, R. Cox, and C. O'Meara*[1]

Outline. . .



This fact sheet outlines considerations for tree placement in the home landscape. The discussion continues in fact sheets 7.832, *Tree Selection* and 7.833, *The Science of Planting Trees*.

The average life of a tree in the landscape is only eight years due to poor design and planting techniques. Homeowners and landscape designers often place trees in situations where trees have little chance to establish and thrive. Successful tree planting and establishment needs attention in these five area:

- Functional design
- Plant selection
- Pre-plant handling
- Planting techniques
- Post-planting care

## Basic Landscape Design Elements

In landscape design, tree placement needs careful consideration to function and design elements. Trees are typically the major plant structure in a landscape. Trees give architectural form and organization to space.

In landscape design, trees should not be randomly placed around the property. Rather place trees as specimens, group plantings or mass plantings.

**Specimen trees** – The individual tree becomes the landscape feature. It is set off from other trees and plants materials by unique spacing, form, color or texture. Specimen trees are often, but not always, a focal point in the design.

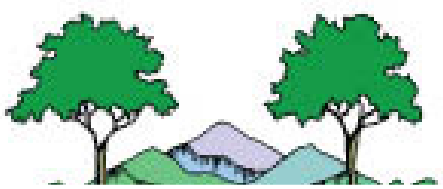
**Group planting** – In group plantings, the trees *as a unit* become the landscape feature. Groupings are often, but not always, the same species. In group plantings, do not mix contrasting forms.

**Mass plantings** – In mass plantings, individual trees lose identity and appear as one larger unit in the design. A group planting may grow into a mass planting as trees mature.

Trees serve several key roles in landscape design. They often **define space**. Their spreading branches create a canopy that forms a ceiling for an outdoor room. Most people are more comfortable with this **ceiling effect**.

Trees create a comfortable outdoor living space with their "ceiling effect".

Trees are used to **frame and mask views**. Vertical views are effectively framed with trees on both sides. The yard should flow into the view. Avoid specimen plants that draw attention away from the view.



When framing a house, consider trees in front, to the sides, and trees that can be viewed over the roofline. For framing, use the point of

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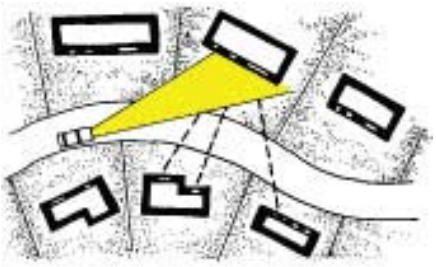
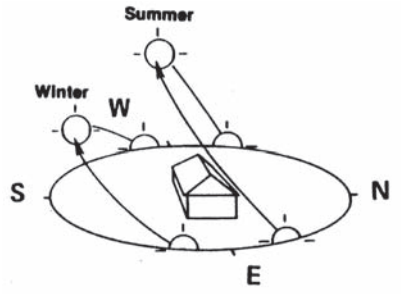
view from which most people would view the house rather than straight on.



## Trees and Energy Conservation

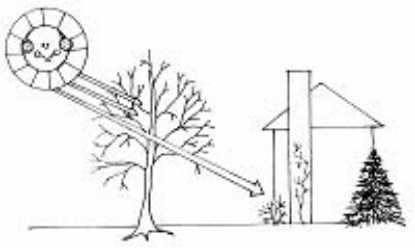



Tree placement can play a significant role in energy conservation. Winter sun penetrating south facing windows can effective heat the home. Summer shade on south and west facing windows and sides of the house provide summer cooling.

In evaluating shading and heating patterns, be aware that shade patterns change with the season and with the latitude.

### Maximizing Winter Solar Heating

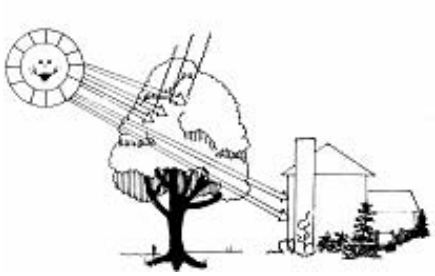
Homes with south-facing windows have a great potential to capture winter solar heat.



In the winter, deciduous tree branches intercept 20 to 55 percent of the sun's radiation. For winter energy conservation, avoid placing trees where they would shade the windows in the winter and open drapes to allow the sun's energy into the home. Winter shade patterns are large, approximately 2 1/2 times the mature height of the tree at Colorado latitudes.

### Maximizing Summer Cooling

In the summer, trees block 70 to 90 percent of the sun's radiation on a clear summer day. When properly placed, trees can reduce air conditioning demand by 10 to 30 percent. Along the Colorado high plains and mountain communities, where temperatures typically cool in the evening, shading a home may adequately moderate temperature without the expense of air conditioning.



**Evapotranspiration** accounts for 70 to 80 percent of the cooling benefit. Under dry conditions (including when water restrictions prohibit landscape irrigation) evapotranspiration shuts down, photosynthesis stops (trees live off carbohydrate reserves) and the cooling effect is reduced. Community temperatures may rise significantly when landscape irrigation restrictions prohibit outdoor watering.

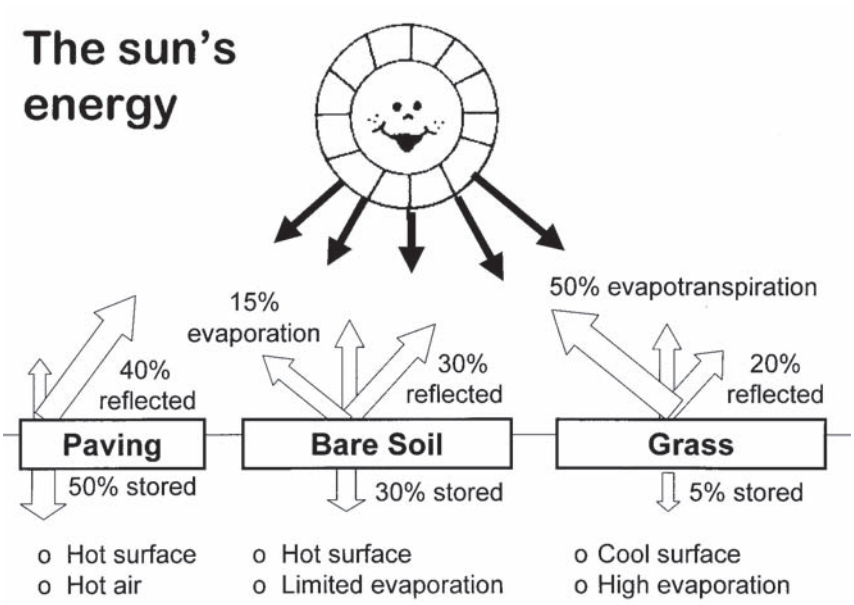
**Shading the House**

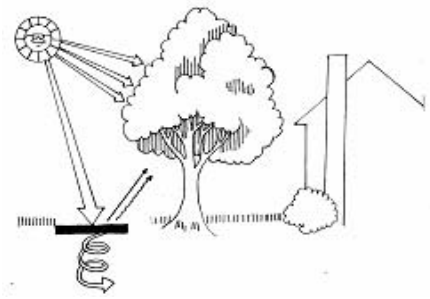
In shading the house, there is a two to three hour lag time on sun and heat build-up. Shading priorities at Colorado latitudes include the following:

1. Shade windows on south and west
2. Shade south walls
3. Shade west walls
4. Shade air conditioning units

**Shading Pavement**

As illustrated in the graph below, a paved area stores approximately 50 percent of the sun's energy and reflects 40 percent as heat. In comparison, a grass area only stores 5 percent of the energy and uses 50 percent for evapotranspiration, resulting in a cooling effect. This cooling effect is only operational when the grass has water for active growth.

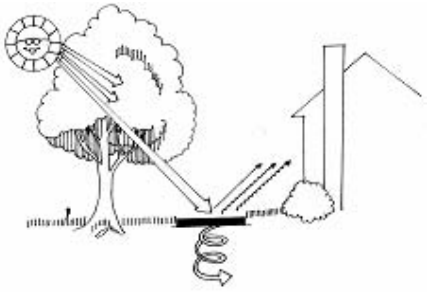


Another important cooling technique is to shade pavement and other heat storing materials like the patio and driveway. Also, minimizing paved surfaces also helps keep the area cool.

Trees and other plant materials may also be used to shield the living space from reflected heat.

**Shading streets**

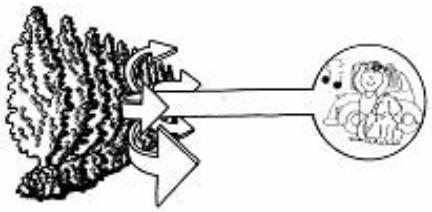


Older communities with tree-lined streets are noted for their pleasing, inviting surroundings that street trees create. Shaded streets are 10 to 40 degrees F cooler.

However, street trees are often predisposed to poor growth and limited life spans due to poor soil conditions. Tree roots can generally spread under a sidewalk into open lawn areas beyond. Root spread under a street is totally dependent on the soil properties created during street construction. The ideal road base is not conducive to root growth due to compaction and low soil oxygen levels.

For tree health, planting strips between the street and sidewalk should be at least 8 feet wide. Tree growth, vigor, and longevity may be reduced with narrower planting strips. In most communities, planting strip width is set by city ordinance in effect at the time of development.

An effective alternative for tree-lined streets is to plant trees in the lawn 8 feet from the sidewalk. This may give trees a better soil environment for root growth resulting in improved tree vigor, growth and longevity. Eliminating the narrow planting area between the street and sidewalk is also an important water conservation technique. In this situation, trees are also less likely to be hit by cars or damaged from road repairs.



Noise Abatement with Trees and Shrubs

Tree and shrub hedgerows (planting belt) effectively abate noise pollution. To be most effective, place the hedgerow close to the noise away from the living area. The hedgerow should be twice as long as the distance from the

noise source to the living space. To be effective, the hedgerow needs to be rather filled in with plant material. A few trees and shrubs here and there do little to abate noise.

### Other Environmental Benefits of Trees

In a study by the USDA Forest Service, 16,000 street trees in Fort Collins, Colorado contributed $2.2 million in environmental benefits. Community forests have many important attributes, including:

- Energy saving from heating and cooling
- Noise abatement
- $CO_2$ reduction – In a Sacramento California study, the carbon sequestration from the community forest more than offsets the inputs from human activity.
- Air pollution abatement
- Hydrology (storm water runoff)
- Property values

*The USDA Forest Service evaluated the benefits of community forests. For each dollar that a city invests in a community tree program, large trees return $1.92 in environmental benefits. Medium size trees return $1.36, while small trees return $1.00.*

To maximize environmental benefits, the goal in community forestry is to have 50 percent of the land covered with tree canopy. That is if we were to look down from an airplane, trees would cover 50 percent of the area. Here in the West, we have a great need to plant more trees in our communities. In wooded communities, the need may be to thin the forest.

To maximize the benefits of our community forests, homeowners and community leaders need to recognize that the primary benefits occur from large trees. We need to enhance efforts to protect and maintain large trees. We need to plan for large trees in landscape design. Small specimen trees may add to the landscape design, but large trees provide significantly more environmental benefits. We need to plant trees in situations where they have the potential to reach a mature size with longevity.

## Growing Space

In the design process, considerations need to be made for the above ground growing space available for the tree (without the need for pruning) and the below ground space for root growth. This is of primary concern under utility lines as the utility has the right-of-way. Frequent pruning required to keep utility lines clear adds to our utility rates.

As discussed above, environmental benefits are significantly greater for larger trees. Consider large tree species whenever the space allows. With proper structural training, large trees have minimal potential for storm and wind damage. Refer to Colorado State University Cooperative Extension pruning fact sheets for details on structural training of young trees.

Homeowners often desire fast growing trees. However, fast growing species are typically more prone to insects, diseases, and internal decay. Fast growing species typically have a shorter life span.

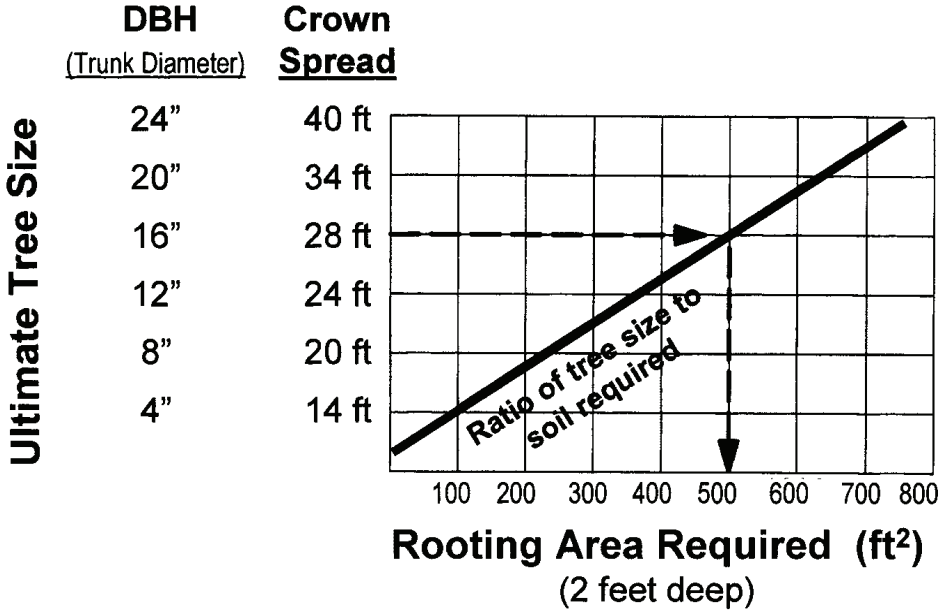
## Rooting Space

Rooting space should be the primary consideration in tree selection. The mature size, growth rate and longevity of a tree are directly related to the available rooting space. Many trees in the landscape are predisposed at planting to a short life and limited growth potential due to poor soil conditions and limited rooting space.

The graph below shows the relationship between root space and ultimate tree size. For example, a tree with a 28-foot wide canopy (16-inch trunk diameter) will require 500 square feet of rooting space, 2 feet deep (1000 cubic feet rooting volume).

Tree roots can generally cross under a sidewalk to open lawn areas beyond. The ability of roots to cross under a street depends on the road base properties. A good road base does not typically support root growth due to compaction and low soil oxygen levels.

The rooting area does not need to be rounded, but can be about any shape. Trees can share rooting space.




## Trees in Planters

Trees are often placed in planters and other sites with limited rooting potential. If the roots can't escape the planting site (root vault) into other soils:

1. Root growth slows when the root vault is filled.
2. Tree growth slows.
3. Trees decline
4. Routine replacement is required.

The average life of trees in sidewalk planters and other restricted root vault sites is 8 years. Home gardener and landscape designers need to understand that with restricted rooting space, growth potential and longevity are reduced accordingly.

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*[1]D. Whiting, Colorado State University, Cooperative Extension consumer horticulture specialist and Colorado Master Gardener coordinator; J. Bousselot, Extension horticulture agent, Douglas County; R. Cox, Extension horticulture agent, Jefferson County; and C. O'Meara, Extension horticulture assistant, Boulder County.*