MASTER GARDENER
COLORADO STATE UNIVERSITY
EXTENSION

CMG GardenNotes #631

Tree Placement: Right Plant, Right Place

Outline:

This publication outlines considerations for tree placement in the home landscape. The discussion continues in *CMG GardenNotes* #632, **Tree Selection: Right Plant, Right Place,** and #633, **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 need attention in these five areas:

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

Tree Placement in Landscape Design

In landscape design, placement of trees 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 plant materials by unique spacing, form, color, and/or texture. Specimen trees are often, but not always, a focal point in the design.

Group plantings – 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. Because we spend a lot of time indoors, people are more comfortable with this outdoor **ceiling effect**. [Figure 1]

Figure 1. 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. [Figure 2]

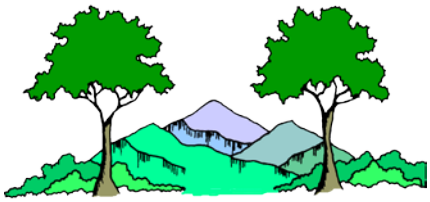


Figure 2. In framing a view, allow the yard to flow into the view.

When framing a house, consider trees in front and to the sides as well as trees that can be viewed over the roofline. For framing, use the point of reference from which most people would view the house rather than straight on. [Figure 3]

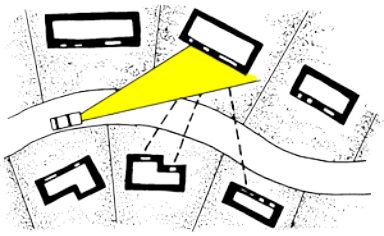


Figure 3. When framing a house, consider how others would look at the home rather than straight on.

Trees and Energy Conservation

Tree placement can play a significant role in energy conservation. Winter sun entering south-facing windows can effectively heat many homes. Summer shade on south- and west-facing windows provides summer cooling.

In evaluating shading and heating patterns, be aware that shade patterns change with the season and with the latitude. [Figure 4]

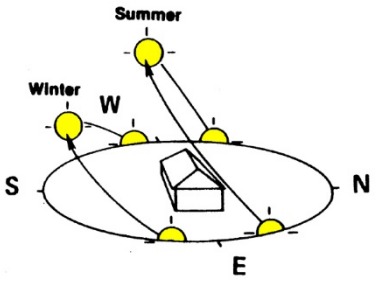


Figure 4. The shade pattern changes with the season and with latitude.

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 20-55% 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 2½ times the mature height of the tree at Colorado latitudes. [Figure 5]

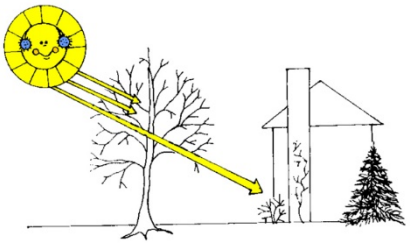


Figure 5. For homes with south-facing windows, tree placement can compromise winter heating potential.

Maximizing Summer Cooling

In the summer, trees block 70-90% of the sun's radiation on a clear summer day. When properly placed, trees can reduce air conditioning demands by 10-30%. Along the Colorado high plains and mountain communities, where temperatures typically cool in the evening, shading a home may adequately moderate temperatures without the expense of air conditioning. [Figure 6]

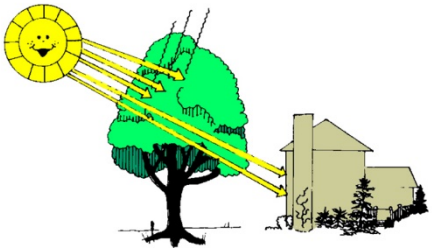


Figure 6. Carefully placed trees can reduce home cooling costs by 10-30%.

Evapotranspiration accounts for 70-80% of the cooling benefit. Under dry conditions (including water restrictions that 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 2-3 hour lag time on sun heat hitting the house and the house becoming extremely hot. 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 Figure 7, a paved area stores approximately 50% of the sun's energy. In comparison, a grass area only stores 5% of the energy and uses 50% for evapotranspiration, resulting in a cooling effect. This cooling effect is only operational when the grass has water for active growth.

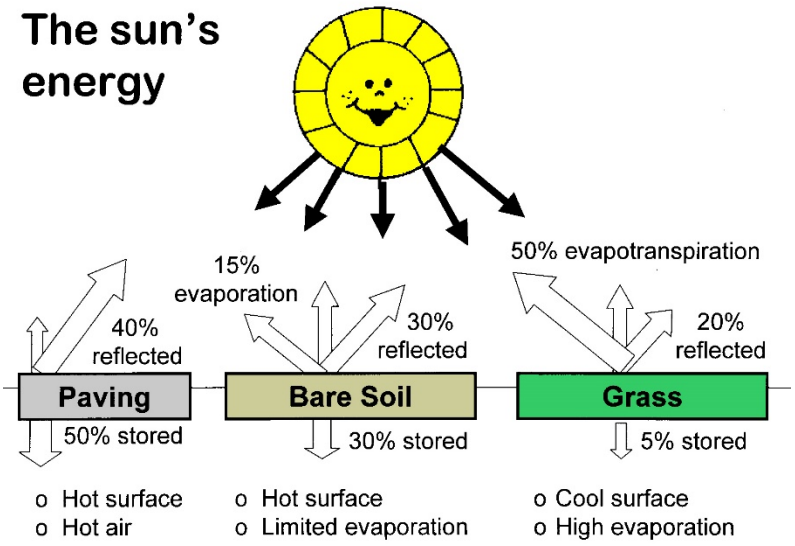


Figure 7. The sun's energy

Another important cooling technique is to shade pavement and other heat-storing materials like the patio and driveway. Also, minimizing paved surfaces helps keep the living area cool. [Figure 8]

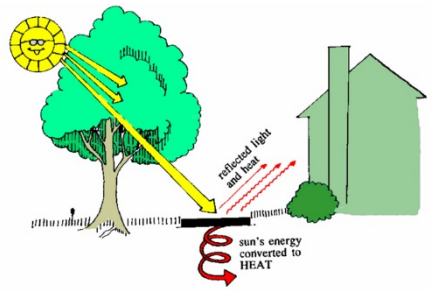


Figure 8. For cooling, shade heat-storing areas and minimize heat-storing surfaces.

Trees and other plant materials may also be used to shield the living space from stored and reflected heat. [Figure 9]

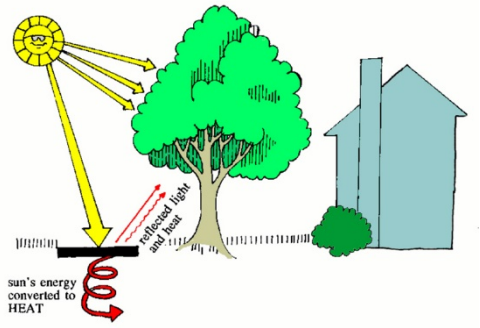


Figure 9. Use trees to cool the air between the heat-storing surface and living space.

Shading Streets

Older communities with tree-lined streets are noted for the pleasing, inviting surroundings that street trees create. Shaded streets are 10°F to 40°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 dependent on the soil properties created during road construction.

When the planting strip between the street and sidewalk is less than eight feet wide, tree health, vigor, and life span will be reduced. In most communities, planting strip width is set by the city ordinance in effect at the time of development.

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

Noise Abatement with Trees and Shrubs

Tree and shrub hedgerows (planting belts) effectively abate noise pollution. To be most effective, place the hedgerow close to the noise source 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 dense. A few trees and shrubs here and there do little to abate noise. [Figure 10]

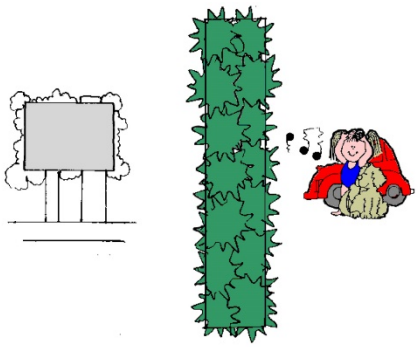


Figure 10. For effective noise abatement, place plant belt next to noise source.

Other Environmental Benefits of Trees

In a study by the USDA Forest Service, the 16,000 street trees in Fort Collins, Colorado, contribute $2.2 million in environmental benefits. The community forest has many important benefits, including:

- Energy saving from heating and cooling
- Noise abatement
- Carbon dioxide 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 (stormwater 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% of the land covered with tree canopy. That is, if we were to look down from an airplane, trees would cover 50% 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

Size is a primary consideration in tree selection. Trees should fit in the available growing space without pruning. 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.

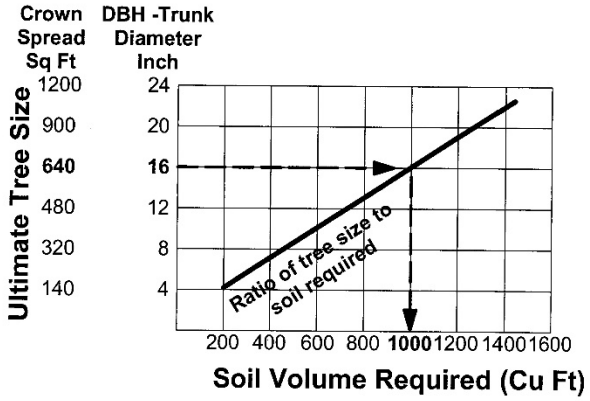
As discussed previously, environmental benefits are significantly greater for larger trees. Consider large tree species whenever the space allows. With proper structural training, large trees have minimal potential for storm and wind damage.

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 shorter life spans.

Rooting Space

Rooting space should be a 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.

Figure 11 shows the relationship between root space and ultimate tree size. For example, a tree with a 16-inch diameter requires 1,000 cubic feet of soil. On a compacted, clayey soil, rooting depth may be restricted to 1 foot or less, and spread would be an area 36 feet in diameter. Anything less will reduce tree size, growth rates, vigor, and longevity. [Figure 11]



Example: A 16 inch diameter tree requires 1000 cu ft of soil

Figure 11. Ultimate tree size is set by the rooting space.

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; it 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 cannot escape the planting site (root vault) into other soils:

1. Root growth slows when the root vault area is filled.
2. Tree growth slows.
3. Tree declines.
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.

Additional Information

CMG GardenNotes on Tree Selection and Planting

#631 Tree Placement: Right Plant, Right Place
#632 Tree Selection: Right Plant, Right Place
#633 The Science of Planting Trees
#634 Tree Staking and Underground Stabilization
#635 Care of Newly Planted Trees
#636 Tree Planting Ste*ps*

Books: Watson, Gary W., and Himelick, E.B. ***Principles and Practice of Planting Trees and Shrubs***. International Society of Arboriculture. 1997. ISBN: 1-881956-18-0

Web: Dr. Ed Gilman's tree planting information at
http://hort.ifas.ufl.edu/woody/planting.shtml

Authors: David Whiting (CSU Extension, retired) with Carol O'Meara (CSU Extension). Artwork by David Whiting; used by permission.

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