Colorado Master Gardener[sm] Program
Colorado Gardener Certificate Training
Colorado State University Extension

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 needs 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 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. 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]

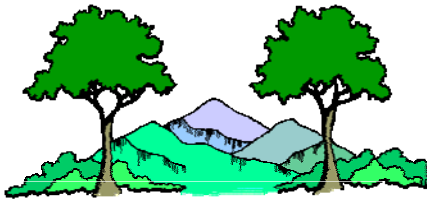

Figure 2. In framing a view, allow the yard to flow into the view.

When framing a house, consider trees in front, to the sides, and 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]

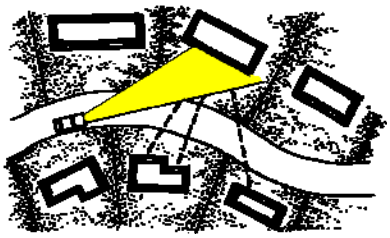

Figure 3. When framing a house, consider how others would be looking at the home rather than straight on.

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 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. [Figure 4]

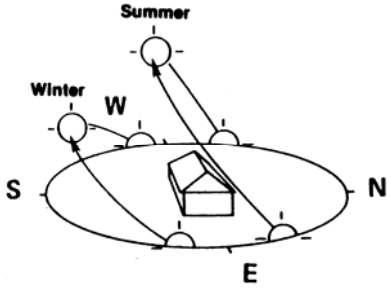

Figure 4. The shade pattern changes with the season and with latitude.

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]

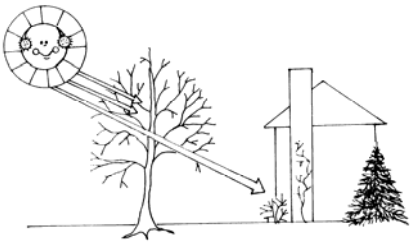

Figure 5. For homes with south facing windows, tree placement can compromise winter heating potential.

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]

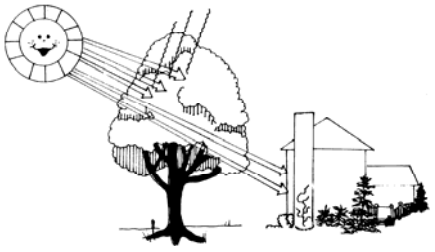

Figure 6. Carefully placed trees can reduce home cooling costs by 10-30%.

Evapotranspiration accounts for 70-80% of the cooling benefit. Under dry conditions (including 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 2-3 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 Figure 7, a paved area stores approximately 50% of the sun's energy and reflects 40% as heat. 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.

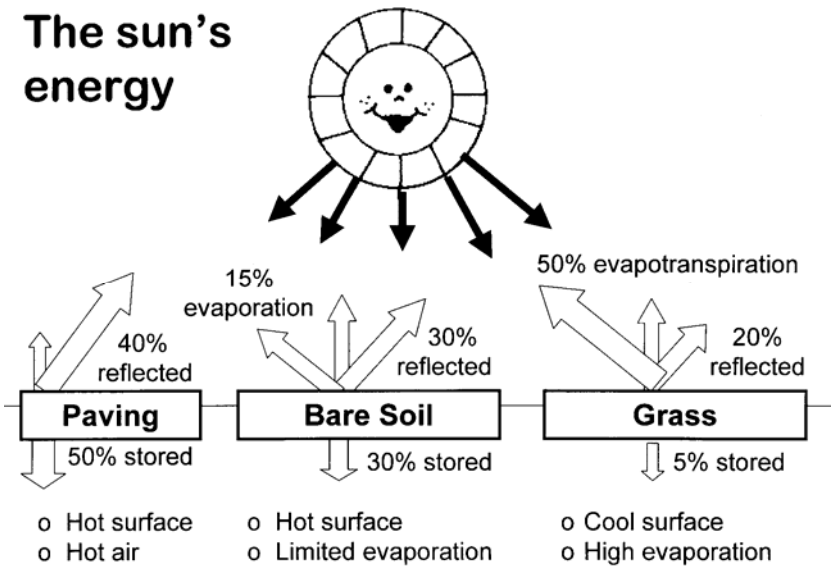

Figure 7. The sun's energy

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]

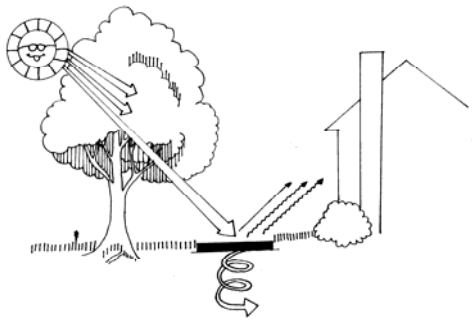

Figure 8. For cooling, shade heat storing areas and minimize heat storing surfaces.

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

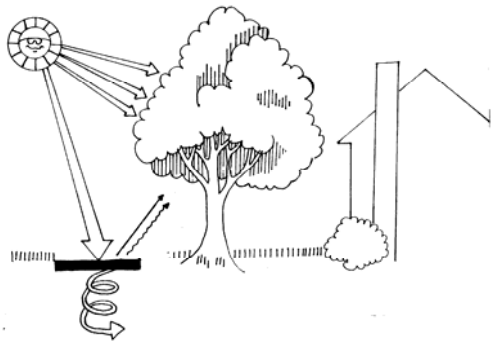

Figure 9. Use trees to cool the air between the heat storing surface and living space.

Shading streets

Older communities with tree-lined streets are noted for the pleasing, inviting
surroundings that street trees create. Shaded streets are 10^{o} to 40^{o} 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 road 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 the 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 in from the street. 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 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 rather filled-in with plant material. A few trees and shrubs here and there do little to abate noise. [Figure 10]

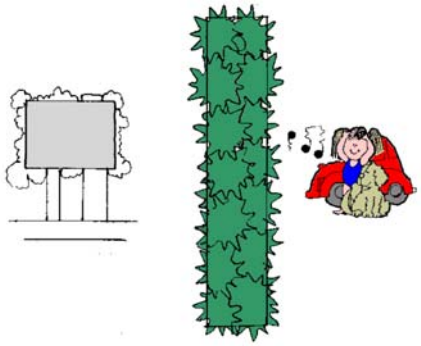

Figure 10. For effective noise abatement, place plant belt next to noise source.

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
- 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% 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 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.

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 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 1000 cubic feet of soil. On a compacted clayey soil, rooting depth may be restricted to 1 foot and spread would be an area 36 feet in diameter. Anything less will reduce tree size, growth rates, vigor, and longevity.

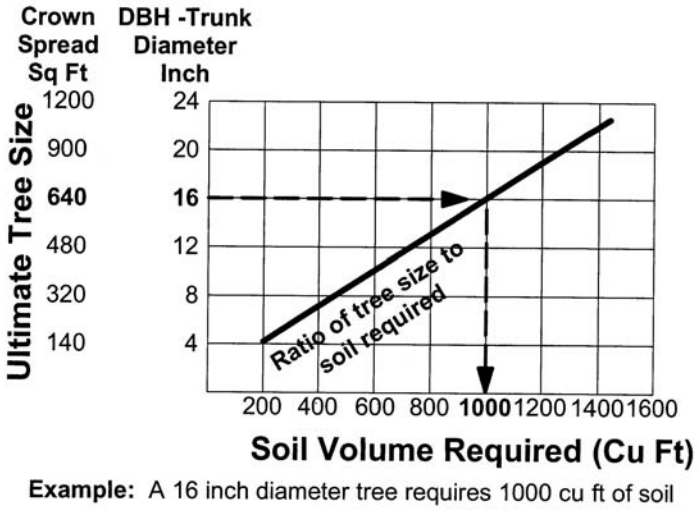

Figure 11. Ultimate tree size is set by the rooting space.

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, 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 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 Steps

- Books: Watson, Gary W. and Himelick, E.B. *Principles and Practices 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

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- Colorado Master Gardener *GardenNotes* are available on-line at www.cmg.colostate.edu.
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