



FORESTRY EXTENSION NOTES

Landscaping for Energy Conservation

Strategically planting trees and shrubs near buildings may be the best long-term investment for reducing home heating and cooling costs. Planting trees and shrubs has very little startup cost and is a long-term investment that will continually reduce energy and fuel consumption. In addition, a well-designed landscape can add 7 to 15 percent to the resale value of your home.

Background

Trees and shrubs reduce energy needs through shading and evapotranspiration (release of water vapor as plants adsorb heat). Groves of trees can be a substitute for air conditioning or reduce the cost of running air conditioners. The air temperature below trees can be as much as 20 degrees cooler than air above nearby blacktop or exposed rooftops, which reduces summer cooling needs. Research conducted by the US Department of Energy (DOE) has shown that proper placement of trees and shrubs around buildings can reduce summer energy needs as much as 50%. In addition, planting windbreaks can reduce your winter heating cost by 10% for urban communities and up to 40% for farmsteads (see ISU publication "Farmstead Windbreaks: Planning", PM-1716). In fact, the DOE has estimated that properly placing as few as three trees can save the average household between \$100 and \$250 annually in energy costs

Planning

To reduce summer energy consumption, trees and shrubs need to be placed in areas where they will benefit the home most by offering maximum shade in the summer but minimum shade in the winter. The majority of unwanted heat in the summer comes from sunlight through windows with twice as much solar heat entering through the west-facing and east-facing windows. Dark colored homes and roofs can absorb an additional 70-90% of the radiation from sunlight. Therefore, planting shade trees on the west and east-side of the home should be of highest priority.



Figure 1. Buildings without trees are fully exposed to solar heat and wind.

In general, planting trees on the south side of your home will not save on your energy bill since the sun is almost directly overhead in summer. That does not mean trees cannot be planted on the south side of the home. During the winter months the sun is at a lower angle causing the majority of sunlight to enter through southern windows, therefore select smaller trees that will not shade your home from the winter sun. Trees on the south side of a building should be planted away from the structure a distance of 2 1/2 times the mature height of the tree to prevent the undesirable shadows that may be cast on the home.

Buildings should be cooled with natural ventilation whenever possible. For example, in Iowa, a grouping of dense foliage trees to the south or southeast should be avoided. Keeping the southern exposure partially open allows summer breezes to cool the home. However, planting a grouping of trees or a windbreak to the north and west of the building will reduce cold winter winds and save on heating cost.

Shading paved areas (i.e. driveways, parking lots, patios, and sidewalks) will help reduce energy consumption. Dark surfaces such as asphalt will absorb solar heat and radiate it back to adjacent buildings. Sunlight striking light colored surfaces like concrete can reflect the solar heat to nearby buildings. On the other hand, sunlight hitting tree foliage will be dissipated through evapotranspiration rather than radiated back into nearby structures.

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Design

Before making any landscaping decisions, you should sketch your ideas first, drawing in existing trees and shrubs, walls, fences, sidewalks, and buildings. Keep in mind the structures that may interfere with new plantings or their growth, such as utility lines and poles. Determine where a tree needs to be planted to reduce the western and eastern sunlight, as well as winter wind. Trees should be spaced 20-25 feet from your home and shrubs should be spaced 1-3 feet from the foundation. Leave adequate ventilation space around heater and dryer vents as well as air conditioners. Finally, check with your city's tree ordinance to determine if a planting permit is needed and if there are species that cannot be planted in your area.



Figure 2. Properly landscaped home with shade trees on the east and west sides.

Species Selection

The goal is to select trees that will block the solar heat early in the morning and late in the afternoon, but will not block the light in the winter when sunlight is desired to warm the house. Deciduous shade trees, those that drop their leaves in autumn, work best to achieve this goal. The ideal shade tree should have a broad crown with dense foliage to offer the maximum benefit. Green and white ash, Kentucky coffeetree, sugar and black maple, red maple, American linden (basswood), red and white oak, and river birch are examples of a few trees that provide excellent shade in the summer and lose their leaves in the winter. Make sure that the ultimate size and shape of the selected shade tree will fit in the planting site, and is compatible with the soils and environmental conditions.

Avoid planting trees on the sunny-side of the house that retain their leaves in the winter such as oaks (black, bur, pin, shingle, and swamp white) and Norway maple, or trees that have dense branches like littleleaf lindens.

Select trees that can be planted within 20-25 feet of windows and will grow at least 10 foot taller than the windows. Fast growing weak-wooded species such as silver maple, willows, cottonwood, and sycamore should not be planted close to the house. These trees tend to be prone to splitting and are often times considered “messy” based

on seed production, amount of leaves, and the amount of broken branches.

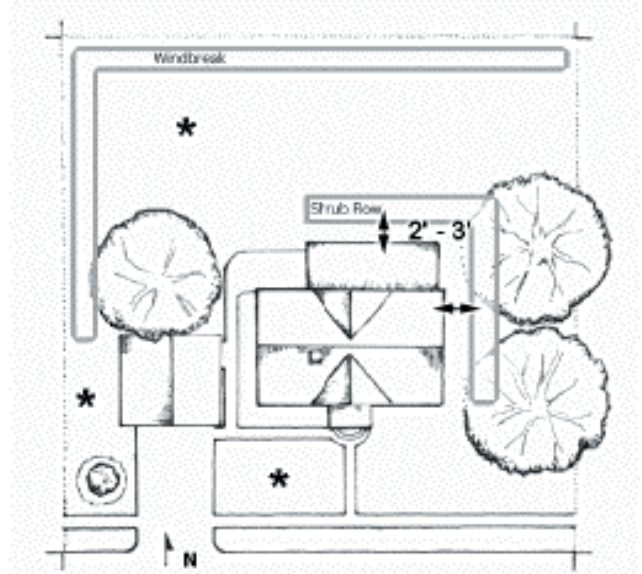


Figure 3. Correctly landscaped home with shade trees, shrubs, and a windbreak. Asterisk indicate areas where smaller trees can be planted.

Select shrubs with dense foliage to be planted next to the foundation to create “dead air spaces”. Some examples of commonly planted shrubs in Iowa include viburnum, spiraea, dogwood, burning bush (*Euonymus*), barberry, privet, lilac, yews, and various junipers. The shrub should be tall enough to shade the foundation, but short enough that it will not interfere with window sunlight in the winter or the summer breeze. Many of the shrubs listed above will need to be trimmed to maintain an appropriate height.



Figure 4. Properly placed windbreaks and shade trees will reduce the winter wind velocity and reduce energy consumption.

By following these simple guidelines you can reduce your home's energy consumption and improve the aesthetics and property value at the same time. Properly maintaining newly planted trees will help ensure reduced energy needs for many years.

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