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Grow Your Own Savings

by Celeste Koon • illustrations by Coraleta Alley • photography by Nick Decker

It's possible to grow energy savings right in your own backyard. Sensible landscaping can cut winter heating bills by as much as 30 percent and summer cooling costs by as much as 50 percent. In addition, if you're saving energy, you're helping conserve oil, coal, and other resources for the future.

Plant a tree stategically and it will shade part of your roof from the sizzling summer sun. Encourage a clematis plant to scale the heights of a trellis so it shades your porch or windows. For winter energy savings, shelter your home from the wind with conifers, or keep your foundation warm with a low wall of slow-growing shrubs.

These are just few of the ways that you can use vegetation to reduce the amount of energy used to cool and warm your home. Landscaping can improve your home by keeping it cooler in the summer and warmer in the winter.

The effects of landscape vegetation can substantially improve the interior temperature of your home. Proper use of shrubs, vines, and trees can minimize the effect of the three major factors responsible for unwanted heat or cold: air infiltration, heat conduction, and the transmission of radiant energy, or sunlight.

The first of these, air infiltration, occurs when outside air seeps into your house through cracks around doors or

This brochure is one part of the Missouri Department of Natural Resources, Division of Energy's educational outreach package for Operation TREE—Trees Renew Energy and the Environment.

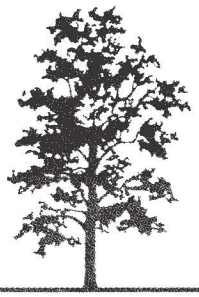
Operation TREE is the department's comprehensive reforestation program. It brings together the variety of action opportunities within the department and focuses them into one campaign. Operation TREE addresses the traditional departmental goals of conserving energy and soil, and preserving state parks and air and water quality. It also addresses the more recently acknowleged concerns of urban heat islands and global warming.

Operation TREE offers citizens, schools, industries, and communities a chance to make positive changes in the quality of the environment. Activities include energy-efficient landscaping demonstration sites, reforestation and regeneration of Missouri state parks, special incentives for tree planting in watershed areas, reforestation of reclaimed mine lands, and informational assistance.

The educational component of Operation TREE explains to everyone—landowners, businesses, and apartment dwellers—why they should plant or protect a tree.

On the home front, it is within one's power to reduce energy use for heating and air conditioning by planting trees, shrubs, and vines. These plants, in turn, capture carbon dioxide in the atmosphere, reduce the rate fossil fuel reserves are used, and lower home heating and cooling bills.

Read on and learn other ways that landscaping can help reduce energy use in the home. These suggestions clearly show how local activities can have global consequences. Working together, this brochure and Operation TREE can show how anyone can "Grow Your Own Savings."



Operation TREE

MISSOURI DEPARTMENT OF NATURAL RESOURCES

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windows, porous materials, abutting walls, and other small openings. Outside air is drawn into or out of the home through these openings by a difference in air pressure between the inside and outside of the building.

Differences in air pressure are the result of the force of wind on an outside surface or by the circulation of warm and cool air within the house. Trees and shrubs can reduce the velocity of wind striking an outside wall of a building. They also can reduce temperature fluctuations inside your house.

The second major way a home gains or loses heat is by thermal conduction. Heat is transferred through the construction materials of the structure. The amount of heat that is conducted depends on the resistence to heat flow (R-value) of the material, its thickness, the surface area, and the temperature difference between the indoor and outdoor layers of the material.

Landscape plantings can yield energy savings when they retard heat transfer. For instance, a tree positioned to shade the west wall in summer helps keep the wall cooler. As a result, there is not as much heat conducted to the inside because the temperature difference between the inside and outside walls is not as great.

Radiant energy, or sunlight, is the third factor involved in a home's heating and cooling efficiency. Shrubbery that shades glass patio doors from late afternoon rays is one example of vegetation's effectiveness in blocking excess radiant energy.

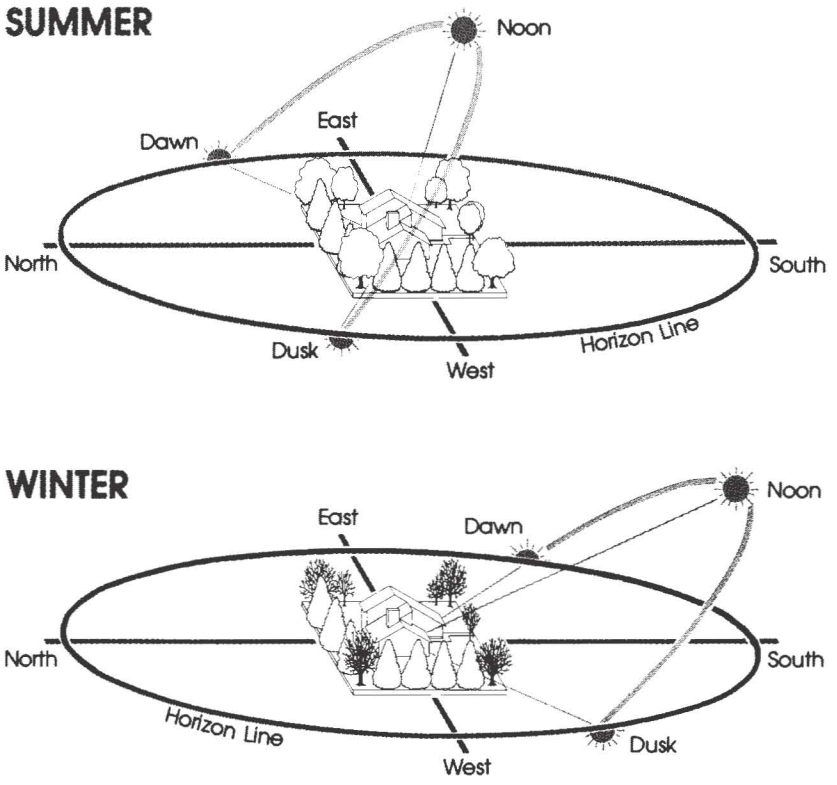
Air infiltration, heat conduction, and radiant energy are the chief forces which raise or lower your home's energy consumption. Plantings around your home can offset the influence of these forces. Selecting the right landscaping methods can help you enjoy moderate inside temperatures, lower utility bills, and the satisfaction of having used fewer natural resources.

Summer Shade

Trees can be excellent sun screens during long, hot summer days. Studies have found that shading the roof, walls, and windows on the west side of a mobile home have reduced annual cooling costs 30 percent to 50 percent. Savings may not be as great for other types of homes, although shading even 20 percent of the roof for the entire day can reduce energy costs.

Solar Angles

The seasonal path of the sun is a major factor in determining the type and location of your plantings. Landscaping for summer, when the sun is overhead, should shade the west and east sides of your home. Landscaping for winter, when the sun is low in the sky, should expose the south of the house for maximum solar gain.



Another study showed that an eight-degree difference between shaded and unshaded wall surface was equivalent to a 30-percent increase in the insulating value for the shaded wall. Differences of more than eight degrees between shaded and unshaded building surfaces are common, which correspondingly increases the value of providing shade.

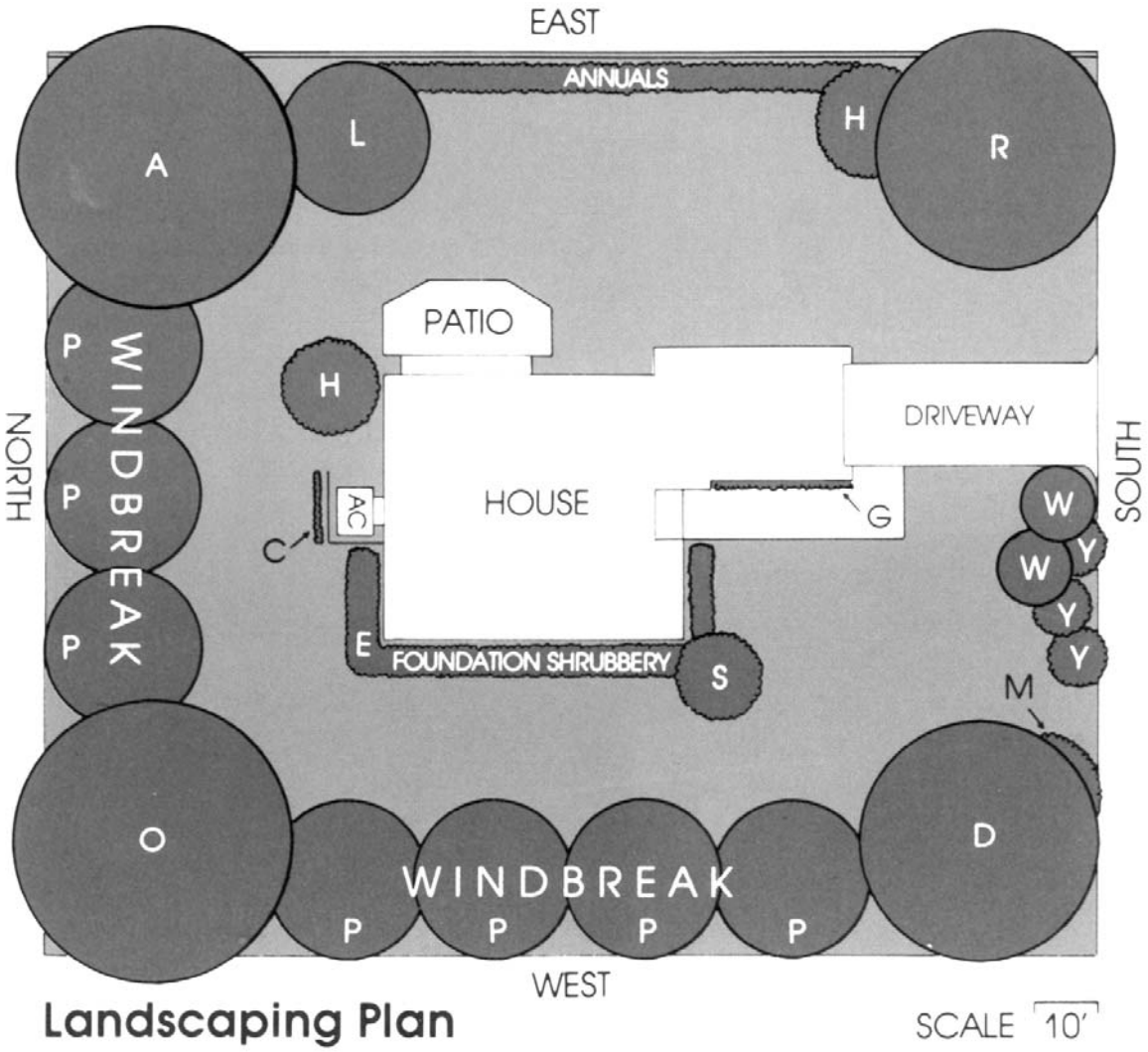
The amount of shade provided by trees depends on the type you plant. Deciduous trees such as white ash, willow-leaf oak, and thornless honey locust are among the species that are desirable. These trees shed their leaves in the fall and they generally have few branches, so they don't block as much sunlight in winter.

Shade trees generally should be planted on the east and west sides of the house. If trees are planted on the south side, they should be pruned along the lower portion of the trunk to allow maximum solar heating of walls in winter. Placement of trees also may depend on maintaining a desirable view from windows, space, appearance, and avoiding overhead wires or underground pipes.

The ultimate height and spread of a tree is the most important consideration. For safety, a tree should not be allowed to get more than 50 percent taller than the highest part of the house unless it is planted almost as far away as its ultimate height. For instance, a tree that will reach 100 feet should be planted at least 75 feet away from the house, and a tree that will reach 20 feet should be planted at least 15 feet away. If your tree will be pruned frequently, then planting distance from the house should be increased by another third.

Energy consumed to cool and heat your home can be greatly reduced by properly using vegetation to landscape it. Careful consideration of the site, climate, and vegetation can ensure the best results around your home. Sensible landscaping can cut summer cooling costs by as much as 50 percent and winter heating bills by 30 percent.

Landscaping to save energy can do more than cut utility bills and increase property values. When you save energy, you help conserve coal, natural gas and other resources for the future.The place to start may be your local nursery where you can get advice on the species that are most likely to grow well and meet your expectations. General landscape techniques can be considered before you visit your local nursery.



Landscaping Plan

SCALE 10'

- Plant deciduous trees such as white ash, willow leaf oak, or thornless honey locust so they shade the roof of your house.
- Use deciduous vines such as bitter-sweet, silver lace, clematis, morning glory, or climbing roses to shade south walls and windows.

LEGEND

A	white ash	**L**	maple
C	clematis	**M**	dwarf mugo pine
D	dogwood	**P**	red or white pine
E	evergreens	**R**	red bud
H	holly	**O**	oak
W	hawthorn	**Y**	yew
G	grapevines	**S**	vibernum (snow ball)

- Plant taller shrubs to shield sliding-glass patio doors or other architectural features on the west side of the house from late afternoon sun.
- Shade your air conditioner to increase its efficiency.
- Plant low-growing shrubs such as yews, junipers, or Japanese holly around your foundation to create a layer of "dead air" for winter insulation.
- Plant a windbreak – even a single row of conifers – to protect your home from prevailing winds during winter.

Another practical means of shading your home's walls is through vines. Vines that grow over porches or arbors can provide pleasant outdoor living spaces as well as shade for walls and windows.

Deciduous vines such as bittersweet, silver lace, clematis, morning glory, grapevines, or climbing roses work well in Missouri's climate. These vines can be trained up a trellis during the spring and summer months and then trimmed back in the winter months when extra sunlight is desired.

Evergreen vines, however, such as English Ivy, should not be used because the vines block the winter sun's warming rays. Some vines also have areial roots that damage paint, wood, brick, or shingles. These should not be grown above the concrete foundation.

By providing direct shade on the walls, vines keep surface temperatures down, thereby reducing heat conduction. Some additional cooling results from the evaporation of moisture from the leaves.

Vines have the further advantage of providing fast-growing shade. While shade trees can take as much as 30 years to mature, certain vines can be pruned and trained upward to shade large portions of a home in less than five years. Vines are especially useful where there is limited ground space.

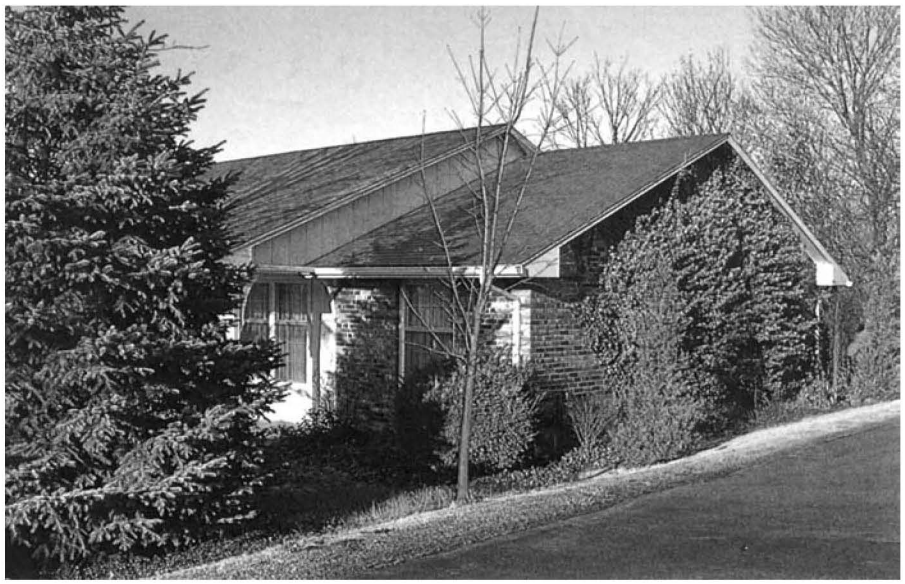
Vines planted close to the house should be trained on a trellis to ensure adequate air circulation and to minimize the potential for moisture damage to the house. Vines planted on porches or arbors also may need to be pruned if they become large and heavy.

Pole beans, scarlet runner beans, climbing squash, cucumbers, melons, cantalopes, and other vines also can be used for shade, depending upon aesthetic considerations and the load-bearing capacity of your trellis or porch.

Planting shrubs can be an attractive way to shade architectural features on the west side of your home that are prone to heat transfer, such as sliding-glass patio doors and windows.

Shrubs for shading need to be of sufficient height to intercept the late afternoon sun, approximately six feet to eight feet. Shrubs should be planted to form a fence between the sun and your house, and their eventual size should be considered when planting.

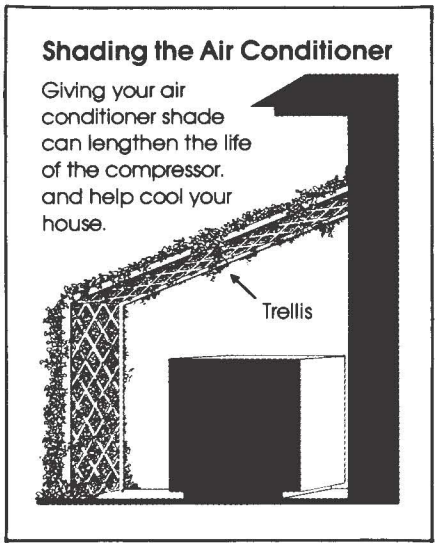
Deciduous shrubs and bushes, such as Korean beauty bush, weigelia, stolinifera dogwood, ironwood, and some of the vibernums can be planted where a view is desired in winter, while evergreens are a good choice if privacy is desired. In addition, properly placed evergreens, such as upright junipers, can offer protection from winter winds.



Vines can provide direct shade for walls exposed to summer sunlight.

Give your hard-working air conditioner a little extra help in cooling the house: Provide it with shade. Spending a few dollars to construct a trellis or to plant a flowering tree or shrub that will shade your air conditioner from midday or afternoon sun can reduce your utility bills. Giving your air conditioner shade also can lengthen the life of the compressor.

Place trellises two feet to three feet away from the air conditioner to avoid obstructing the air intakes and to allow access to the unit. Place trees or shrubs far enough away that shadows, rather than leaves, fall on the air conditioner.



Winter Windbreaks

When the seasons change, keeping your house warm enough can become a problem. The combination of artic air, short daylight, and strong winter winds can make it harder to stay warm and cozy. Fortunately, you can reduce the amount of wind rattling your windows with a row or stand of pines, cedars, hemlock, spruce, fir, conifers, or American holly.

A windbreak should be located upwind of your house in the direction of the prevailing wind. In Missouri, the prevailing winter wind is generally from the west or north. Hills, valleys, and tall buildings, however, can channel air so that the wind may blow from a different direction at your home.

One way to determine the wind direction for your particular location is to study the snowdrifts in your yard. Snowdrifts form downwind around the edges of obstacles that block the wind. A windbreak in your yard should produce a similar snowdrift pattern at its edges if it is located for maximum protection against cold, stormy winds.

Regardless of the particular wind direction that prevails, a windbreak should be located at right angles to this direction — or directions, if your house is located in an area with variable winds. The windbreak also should be planted upwind from the home, at a distance that depends on tree height.

Windbreak trees can grow to a sufficient height to protect your house long before they reach their maximum height. A rough rule of thumb is to plant windbreaks 40 to 50 feet upwind of a single-story home where possible. You can obtain more information from the nursery where you obtain trees, soil conservation district offices, and University of Missouri Extension offices.

The exact design and composition of your windbreak will depend on the amount of space available. Where space is limited, a single row of spruce trees can be effective in reducing wind velocities. Planting several rows of evergreen species is even more effective. The outside rows of a windbreak should be trees or large shrubs with dense low growth. The center rows should be faster, taller growing trees such as pines.

A windbreak deflects the wind around a house, which provides an area of low wind speed near the home. This in turn reduces the amount of air infiltration and heat conduction experienced by the structure.

One study in Nebraska compared the fuel requirements of identical test houses that maintained a constant inside temperature of 70 degrees Fahrenheit. The house protected by a windbreak used 23 percent less fuel. In another study in South Dakota, a house with a windbreak used one-third less energy through the winter than a similar house without a windbreak.

A windbreak can be an expensive investment that will not pay off immediately in terms of energy savings. But, like many investments, the long-term benefits can prove valuable. With a windbreak, you will have a more comfortable home and a more attractive property, and you will help conserve soil and water.

Besides planting windbreaks, another way to conserve heat during winter is to wrap your foundation in a blanket of air. Shrubs that hug your home's foundation can help save both heating and cooling costs. They create a "dead air" space, which slows the escape of warm air from the house in winter. At the same time, this air space provides insulation from hot outside air in the summer, reducing the need for air conditioning.

Again, evergreen trees and shrubs are thicker and more effective than deciduous plants in creating a "blanket" of still air around your foundation. Yews, junipers, Japanese holly, and some other deciduous hedge-forming shrubs make good foundation warmers and add to the attractiveness of your home.

Easy Energy Savings

There are many ways to save energy, but taking advantage of the natural benefits of landscaping is one of the easiest. The right plantings in the right locations can make a difference in the overall heating and cooling demands of your home. Energy-efficient landscaping translates to lower energy use, lower utility bills, and conservation of our natural resources used to make energy.

In addition, energy-efficient landscaping has other environmental benefits. When less coal is burned to produce electricity, air pollution is reduced. When you use less fuel oil, oil reserves last longer. Moreover, the amount of fuel that has to be shipped in trucks or pipelines decreases, reducing the chance for spills.

Landscaping also has positive as well as preventive environmental side effects. Trees, shrubs, and vines help reduce moisture loss from wind evaporation and break the force of raindrops so they soak into the ground and recharge ground-water supplies. When rainwater soaks into the ground rather than running off, less soil erosion and sediment muddy our streams.

It all starts in your backyard.

Start saving energy with your first home: Landscape to protect the foundation from prevailing winds. Simple measures can yield significant savings.