



Landscaping for Energy Efficiency



“ENVIROSCAPING”

All the buildings in the United States **consume 6 times more energy** and **emit 6 times more greenhouse gases** than all the cars and trucks in the country.

Computer models devised by the United States Department of Energy predict that the proper placement of only 3 trees will save the average household between \$100 and \$250 in energy costs annually.



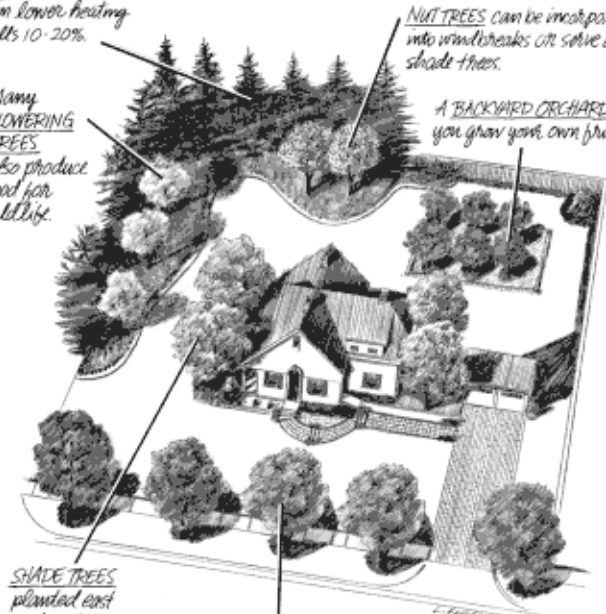
TREES around your home can increase its value up to 15% or more. The trees you plant remove CO₂ from the air, produce oxygen, and give songbirds a home. Trees provide many other benefits.

A WINDBREAK can lower heating bills 10-20%.

Many FLOWERING TREES also produce food for wildlife.

NATIVE TREES can be incorporated into windbreaks or serve as shade trees.

A BACKYARD ORCHARD lets you grow your own fruit.



SHADE TREES planted east and west of your home can cut cooling costs 15-35%.

STREET TREES shade the concrete and help cool the entire neighborhood.

Working with the Wind

WHAT FLIES FOREVER AND RESTS NEVER?

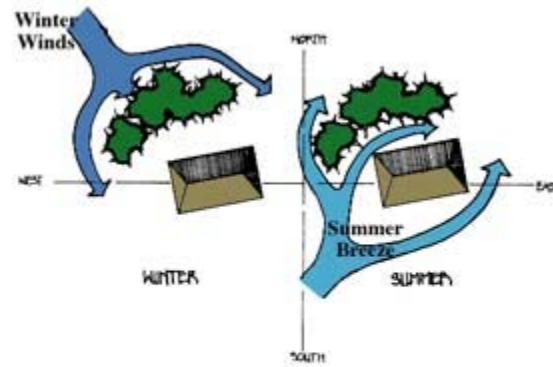
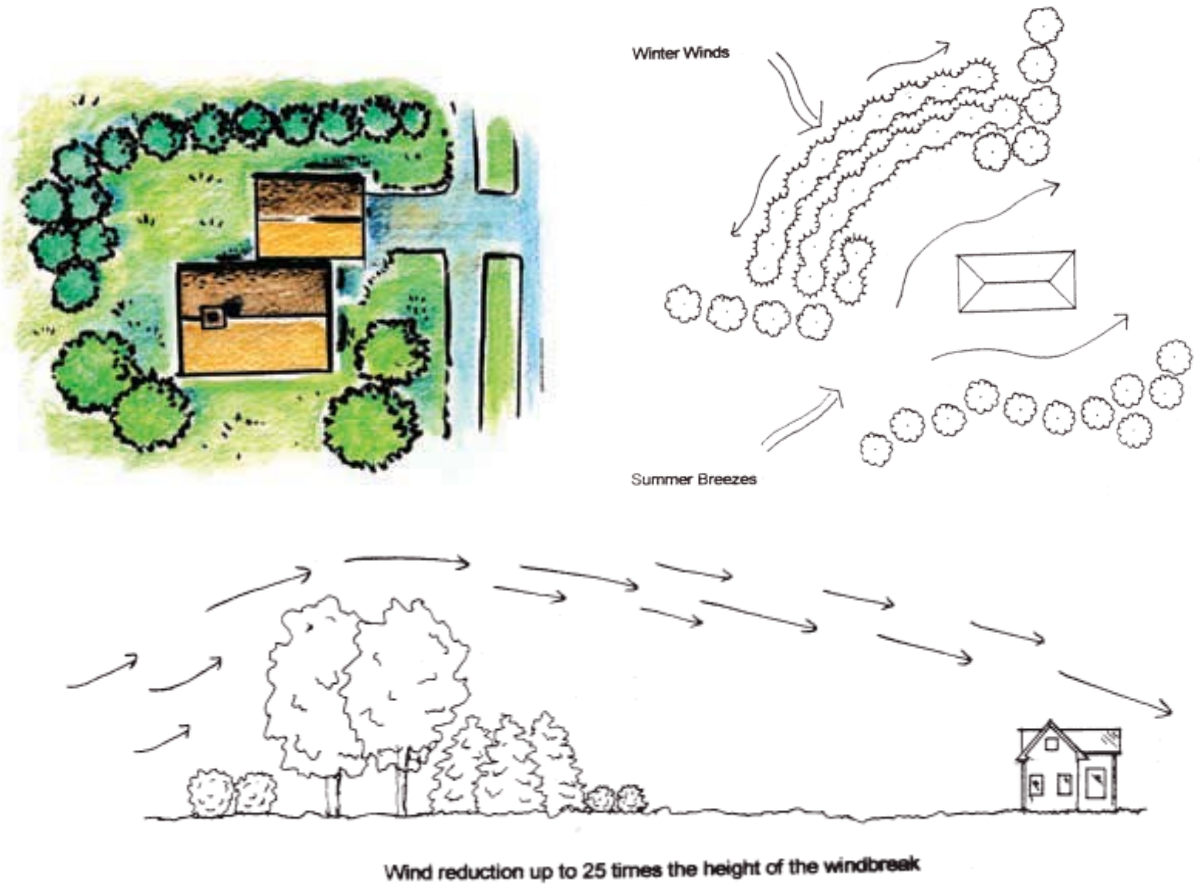


Figure 9. Rows of shrubs on the northwest side protect from cold winter winds and direct summer breezes.

Winter winds increase the rate of air exchange between the interior and exterior of a house, lowering the house's interior temperature and thereby increasing the heating demand.

We generally have a better appreciation for the breezes in the heat of the summer.





They are most effective when plants branch to ground level.

The wider the planting, the more effective the windbreak.

When planting more than one row, stagger the plants.

When using only evergreen plants, two or three rows are adequate. When using deciduous materials, four to five rows are necessary. A mixture of both types is most effective.

Where space is adequate, plant a row of fast-growing species (such as poplar), but make plans to remove them as soon as better plants have developed adequate height.

When planting several rows of plants, the heights of the rows should vary to give an uneven rather than an even upper edge.

Windbreaks should allow some wind penetration. Impenetrable windbreaks create a partial vacuum on the protected side, reducing their effectiveness.

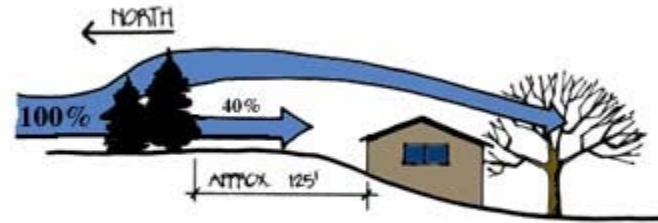


Figure 6. A 20-foot-tall evergreen creates a windbreak on the north exposure.

The Windbreak

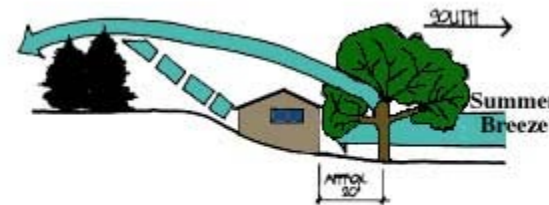


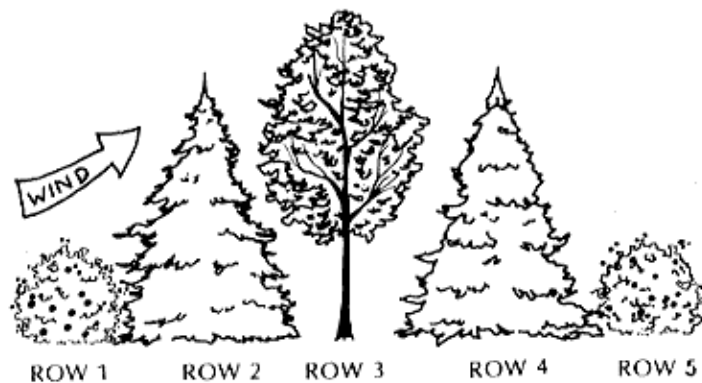
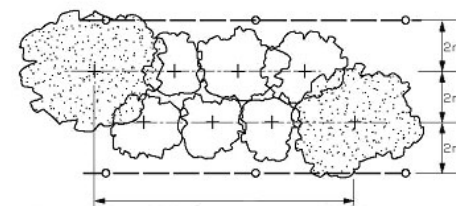
Figure 7. A tall, deciduous tree on the south exposure allows air filtration beneath and through the canopy in summer.

Windbreak Trees and Height at Maturity

American Holly: 30-50'	Bearberry (<i>Arctostaphylos</i>): 4-20'
Common Juniper: 5-30'	Common Juniper (pruned back): 3-30'
Eastern Hemlock: 60-70'	Compact Oregon Grape Holly: 2-3'
Eastern Red Cedar: 50-75'	Cotoneaster: 3-15'
Eastern Arborvitae: 50-75'	Inkberry Holly: 4-6'
Loblolly Pine: 90'	Mountain Laurel (<i>Kalmia latifolia</i>): 7-15'
Pitch Pine: 50-60'	Northern Bayberry: 4-8'
Rosebay Rhododendron: 20-35'	Southern Bayberry/Wax Myrtle: 6-12'
Shortleaf Pine: 100'	Sweetbay Magnolia (semi-evergreen): 12-20'
Virginia Pine: 50-80'	Wild Hydrangea (<i>Hydrangea arborescens</i>): 3-9'
White Pine: 75-100'	
Foundation Shrubs	



Two row shrub and tree windbreak



Sun and Shade



**WE INTUITIVELY KNOW THE VALUE OF TREE SHADE
WHEN WE SEARCH FOR THE SHADE OF A TREE IN THE
EXPANSE OF AN ASPHALT PARKING LOT.**





USE DECIDUOUS TREES

Deciduous plants drop their leaves in winter and have the advantage of allowing sun to reach buildings in the winter for warmth, yet providing shade during the summer.

SUMMER SHADE TREES

Ginkgo, Kentucky Coffee Tree, White Ash and Green Ash...

Trees selected for this use should mature large enough to throw shade on the roof of the house on a midsummer afternoon.

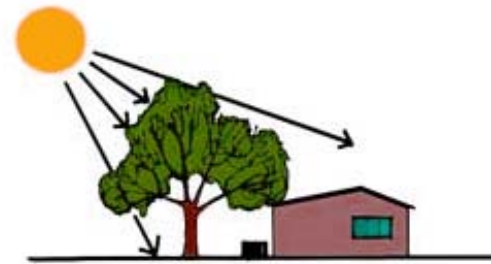
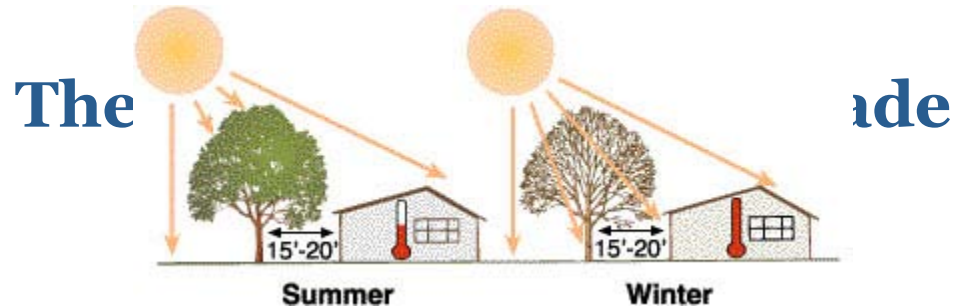


Figure 2. An air conditioning unit on a south or west wall should be protected from the sun.



Insulating your Home Naturally



**USE TREES TO CREATE A BLANKET OF AIR AROUND
YOUR HOME**



Shrubs planted next to the house can provide insulation because they create a dead air space next to the foundation.

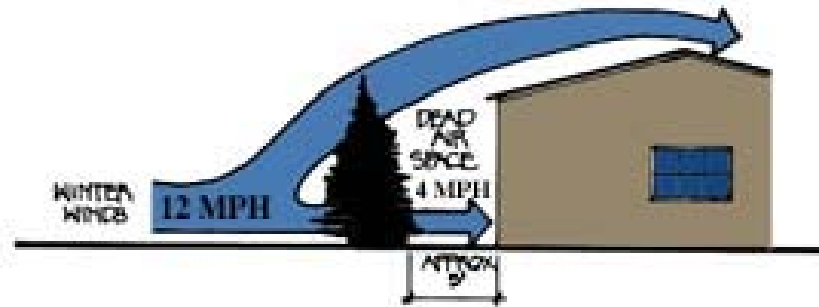
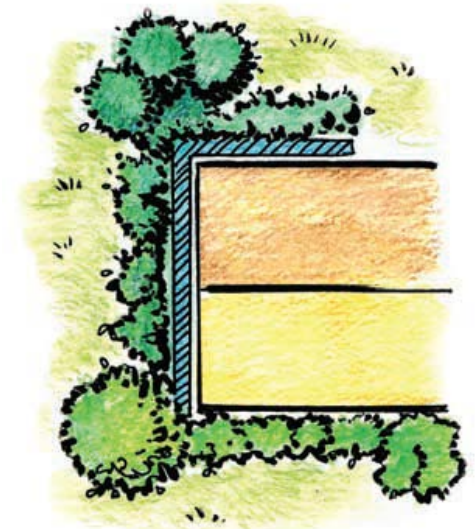
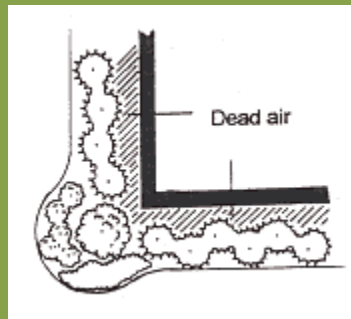


Figure 8. Evergreens adjacent to the north and west sides of a house reduce wind speed and create dead air space for insulation.



Natural Cooling



EVAPOTRANSPIRATION

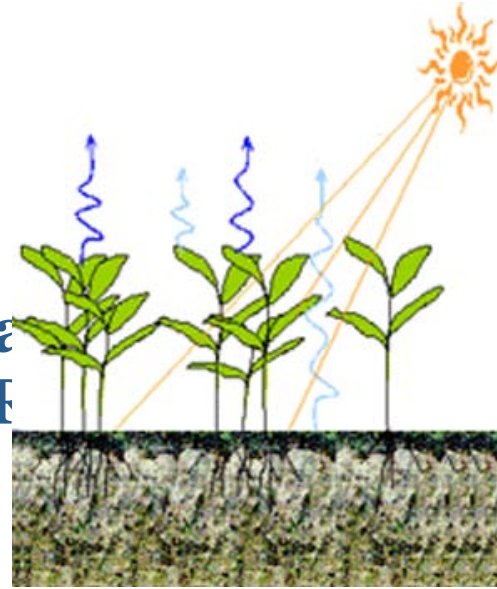




Evapotranspiration is a term used to describe the sum of evaporation and plant transpiration from the earth's land surface to atmosphere.

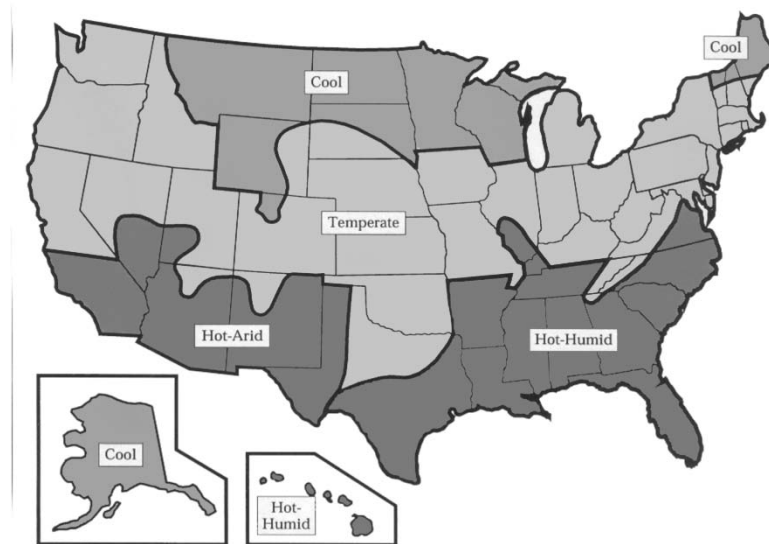
...Basically that means that green groundcover will make a space cooler in the summer than blacktop or paved areas.

Transpiration =
EVAPOTRANSPIRATION =



Climate

**THE UNITED STATES CAN BE DIVIDED INTO FOUR
GENERAL CLIMATE REGIONS**



United States Climate Regions



What energy saving landscape strategies should you use for your Climate Region?

Hot-Arid

- ❑ Provide shade to cool roofs, walls, and windows.
- ❑ Allow summer winds to access naturally cooled homes.
- ❑ Block or deflect winds away from air-conditioned homes.

Temperate

- ❑ Maximize warming effects of the sun in the winter.
- ❑ Maximize shade during the summer.
- ❑ Deflect winter winds away from buildings.
- ❑ Funnel summer breezes toward the home.

Hot-Humid

- ❑ Channel summer breezes toward the home.
- ❑ Maximize summer shade with trees that still allow penetration of low-angle winter sun.
- ❑ Avoid locating planting beds close to the home if they require frequent watering.

Cool

- ❑ Use dense windbreaks to protect the home from cold winter winds.
- ❑ Allow the winter sun to reach south-facing windows.
- ❑ Shade south and west windows and walls from the direct summer sun, if summer overheating is a problem.





Consider your homes MICROCLIMATE



The climate immediately surrounding your home is called its microclimate. Depending on the area around your home, you may find yourself in a microclimate different from the climate region around you.

Your homes microclimate may be more sunny, shady, windy, calm, rainy, snowy, moist, or dry than average local conditions. These factors all help determine what plants may or may not grow in your microclimate.

Choose plants that do well in your specific microclimates

-  Sun-loving plants for sunny areas
-  Shade-loving plants for shady areas
-  Plants that like acid soils for under oaks, pines, etc.
-  Plants that like wet soils along lakefronts and in wet spots in the landscape

Choosing Native Plant Species



“NATURESCAPING”



www.PLANTNATIVE.org

Why Naturescape?



- **Low maintenance:** plants native to your area will not need human care to thrive
- **Improve public health:** no pesticides or fertilizers should be used, meaning no harmful runoff
- **Saves money:** The U.S.Environmental Protection Agency estimates that the cost of maintaining an average lawn is \$700/year. Add shrubs and/or flower beds and the cost goes up. Add irrigation and the cost goes up considerably. Irrigation systems for a 1/2 acre lot can run \$10K.
- **Saves water:** 30% of water consumed on the East Coast goes to watering lawns.
- **Design for wildlife:** everything in an environment works off of its surroundings. Certain wildlife local depends on the existence of specific plant species in order to live. Many beautiful songbirds are losing their natural habitat to urbanization and agricultural development, will find comfort in taking shelter in your backyard.

Lawn Maintenance

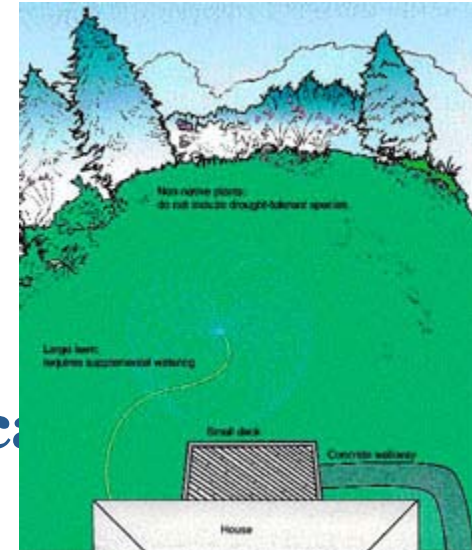
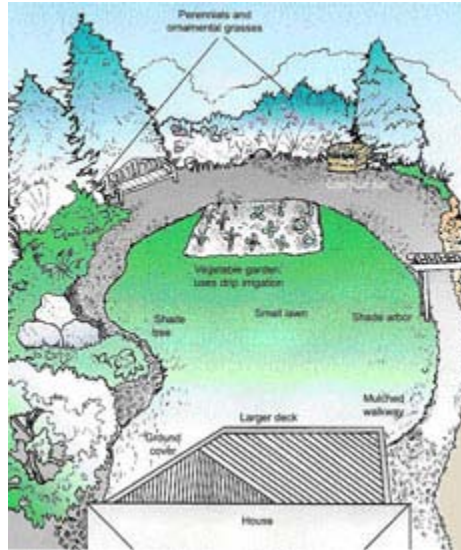


KEEP PLANTS WITH SIMILAR NEEDS WITH EACH OTHER.

- **REDUCE WATER AND ELECTRIC BILLS = \$\$\$**
- **HEALTHIER AND LESS STRESSED PLANTS**
- **DECREASE PESTICIDE AND FERTILIZER USE= DECREASE AQUIFER CONTAMINATION**



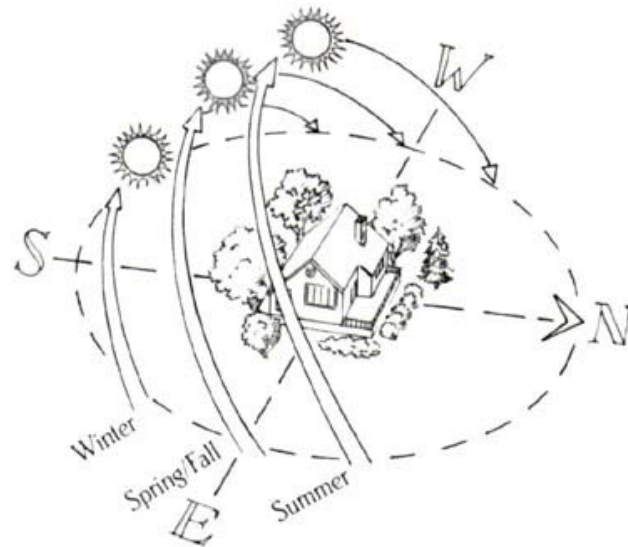
- 1. Planning and design
- 2. Selecting and zoning plants appropriately
 - Limiting turf areas
 - Improving the soil
 - Irrigating efficiently
 - Using mulches
 - Maintaining the landscape



Home Design and Orientation



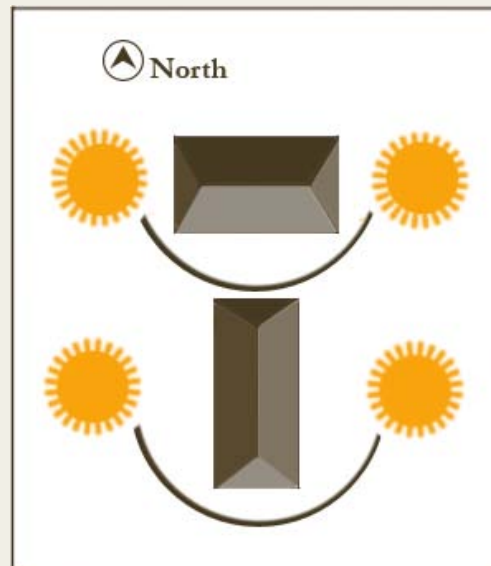
IF YOU ARE FORTUNATE ENOUGH TO DESIGN YOUR OWN HOME...



How-To Design Your Home



- ❑ Align the home's long axis in an east-west direction.
- ❑ The home's longest wall with the most window area should face south or southeast.
- ❑ North-facing windows receive little direct sunlight.
- ❑ The home's north-facing and west-facing walls should have fewer windows because these walls generally face winter's prevailing winds.



Urban Alternatives



WHAT CAN BE DONE ON SMALLER LOTS



Figure 5. An arbor reduces heat and glare and provides a cool, attractive sitting area.

Resources



- *Consumer Energy Information: EREC Fact Sheets*, U.S. Department of Energy, on internet at <http://www.eren.doe.gov/erec/factsheets/landscape.html>.
- *Homeowner's Guide to Landscaping that Saves Energy Dollars*, Ruth Foster, David McKay Company, Inc., 1978.
- *Landscaping for Energy Conservation*, Colorado State University Cooperative Extension, L. Walker, on internet at: <http://www.colostate.edu/Depts/CoopExt/PUBS/GARDEN/o7225.html>.
- <http://www.eere.energy.gov>
- <http://www.pioneerthinking.com/landscape.html>
- Rembert, Tracey C. "Tree Power – Landscaping to Save Energy." *The Environmental Magazine*, May, 1999
- <http://extension.missouri.edu/xplor/agguides/hort/go6910.htm>
- <http://aggie-horticulture.tamu.edu/extension/homelandscape/energy/energy.html>

