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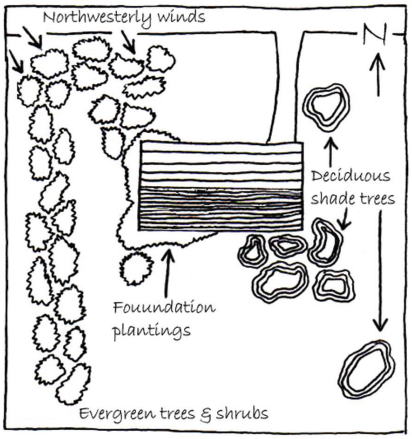
Energy Saving Landscaping

Landscape to Save Energy

Properly placed trees, shrubs and groundcovers help reduce home energy costs, increase comfort, remove pollutants from air, absorb carbon dioxide and produce oxygen. Landscape plants provide habitat for wildlife, insects that are essential for pollination and help manage landscape pests. These critical services are in addition to the roles trees, shrubs and other plants play in beautifying the landscape, increasing property values and potentially conserving water resources. Well-planned landscaping for energy efficiency can reduce heating and cooling costs by 10 to 30 percent.



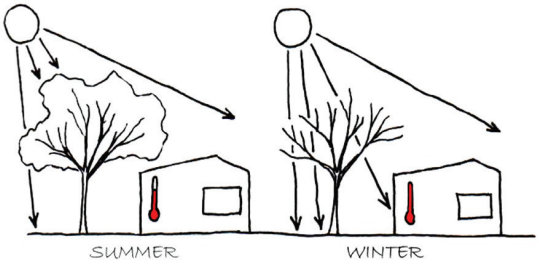
Landscaping to save energy contributes to lowering demand for fossil fuels and the costs of extraction, refining and delivers. By reducing demands on energy delivery systems, the costs of maintenance and needs for expansion are eased. Energy conservation through landscaping helps curb air, water and soil pollution. Efficient landscaping counteracts the urban heat island effect where heat is increased due to high thermal capacity of concrete, steel and asphalt; lack of exposed soil; heat generated by industry, domestic heating and motor vehicles; and increased atmospheric pollution. Energy-smart plantings protect the health of humans and other living things and slow global warming.

Some landscaping for climate impact will produce benefits within a few years (such as foundation plantings) while others (such as windbreaks) will take much longer before providing their full energy conservation value. The planting scheme does not need to be massive. Computer modeling by U.S. Department of Energy has shown that three well placed trees, including a deciduous tree (one that drops its leaves in fall) for shading the south side of a house in summer, can save the average household cooling and heating costs.

Begin energy saving landscape planning by (1) determining the direction your property faces and (2) carefully evaluating existing plants. Identify plantings that may already play a role in an energy conserving landscape. These plants will require less investment and be larger and better established than new plantings. If some of these existing plants need to be replaced, it may still be wiser to maintain them while inter-planting new, more desirable species. Less desirable plants may then be thinned out when the newer plants are established.

Summer Benefits

Trees and shrubs can be sited to direct air movement into living areas, channel breezes to increase wind speed through outdoor living spaces and reduce glare and reflection of heat from hard surfaces. These plantings shade roofs and outdoor air conditioning units, walls and windows to keep them cool, prevent heat buildup behind and beneath them and provide outdoor cooling as moisture evaporates from plant leaves.



Building Strong and Vibrant New York Communities

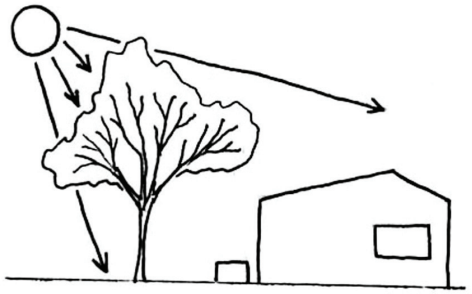
Deciduous trees are also important in shading driveways and parking areas. Shade trees cool paved surfaces and save fuel because they reduce hydrocarbon evaporative emissions from parked vehicles. By cooling pavement, trees limit the heating up of summer rainwater before it flows into waterways where temperature-sensitive fish and other aquatic species reside. Trees also intercept and slow summer rains as they fall on impervious paved surfaces and thus reduce stormwater runoff that carries pollutants into waterways.

Shade Trees and Vines

Deciduous trees and vines can shade your home from the sun's heat. These trees and vines can cut air conditioning bills by 20 to 40 percent. The canopies of large deciduous trees on the east, south, and west sides of the house protect the home from hot summer sun. Shading is important for windows and glass doors. On the south side, the shade from the tree should extend over the roof to prevent summer heat build-up in the attic. Shading the roof from afternoon sun can reduce indoor temperatures by as much as 8 to 10 degrees F.

In tree selection, check the mature height and spread of species so that they will not be too close to the house. Large trees should be planted at least 15 to 20 feet from the side or 12 to 15 feet from the corner. Small deciduous trees may be used to shade windows and walls from hot summer sun. Because their canopy spread is smaller, small trees may be situated closer to the house. Some smaller trees may be planted as close as 10 feet from the house, but planting them 12 to 15 feet away is a better guideline. Fruit bearing trees are best located away from driveways, entranceways, patios and decks so that fallen fruit does not become a maintenance problem.

Shading outdoor air conditioning units can reduce indoor temperatures by up to three degrees F. However, trees and shrubs should not obstruct air flow or access for service. When planting, locate plants so that when they reach their mature size they will be at least three feet away from the compressor.



The following is a list of deciduous trees appropriate for shading homes, patios and decks and driveways.
(See also http://www.hort.cornell.edu/UHI/outreach/recurbtree/index.html for more small and large trees.)

Large Trees	**Native**	**Mature Height.**	**Small Trees**	**Native**	**Mature Height**
Black Gum *Nyssa sylvatica*	Yes	30- 50'	Amelanchier (Serviceberry) *Amelanchier* spp.	Yes	15-25'
Carolina Silverbell *Halesia carolina*	Yes	30-40'	Amur Maple *Acer tataricum* ssp. *ginnala*	No	15-18'
Chinese Scholar/Japanese Pagoda Tree *Styphnolobium japonicum*	No	50- 75'	Cornelian Cherry *Cornus mas*	No	15-20'
Honey Locust *Gleditisia triacanthos*	Yes	35- 70'	Crabapple (disease resistant varieties) *Malus* spp.	No	10-20'
Little-Leaf Linden *Tilia cordata*	No	60- 70'	Eastern Redbud *Cercis canadensis*	Yes	25-35'
London Plane Tree *Platanus* x *acerifolia*	No	70-100'	Flowering Dogwood (disease resistant and hybrid varieties) *Cornus* spp. and hybrids. **C. florida* is native.	Yes and No*	15-30'
Pin Oak *Quercus palustris*	Yes	60- 70'	Goldenrain Tree *Koelreuteria paniculata*	No	25'
Red Maple *Acer rubrum*	Yes	40- 60'	Japanese Maple (in protected site) *Acer palmatum*	No	15-25'
Red Oak *Quercus rubra*	Yes	60- 75'	Japanese Snowbell *Styrax japonicum*	No	30'
Sawtooth Oak *Quercus acutissima*	No	40- 60'	Japanese Tree Lilac *Syringa reticulata*	No	30'

Large Trees	Native	Mature Height.	Small Trees	Native	Mature Height
White Oak *Quercus alba*	Yes	50- 60’	Kousa Dogwood *Cornus kousa*	No	20-30’
Willow Oak *Quercus phellos*	Yes	40- 60’	Paperbark Maple *Acer griseum*	No	20-30’
Zelkova *Zelkova* spp.	No	50- 60’	Saucer Magnolia *Magnolia soulangiana*	No	25-30’
Yellowwood *Cladrastis kentukea*	Yes	30- 50’	Trident Maple *Acer buergerianum*	No	20-30’

Caution: Evergreen trees should not be planted for shade. The pyramidal shape of most evergreens is ineffective at keeping summer sun from heating a house and evergreen branches may block the lower winter sun from warming and lighting the house.

Deciduous vines trained up walls or trellises on the south side of a structure can provide shade. An arbor can shade walls and windows while creating a pleasant sitting area. Woody vines absorb and reflect the sun's rays in summer. For wood sided houses, grow vines up trellises rather than directly on structures where they may damage wood.

The table below lists suitable woody vines and their notable attributes. These vines take some time to establish. For a quick and economical effect, annual vines (e.g. moon vines, morning glories, black-eyed Susan vine, passiflora and mandevilla) can be planted from seed or transplant and will usually provide needed shade in time for the hottest summer weather.

Deciduous Vines	Native	Attributes
American Wisteria *Wisteria frutescens*	Yes	fragrant pale lilac blooms, long life; **avoid** invasive Chinese & Japanese Wisterias
Boston Ivy *Parthenocissus tricuspidata*	No	fall color from orange to burgundy; the ivy of Ivy League; safe on brick and stone; may damage wooden siding; fast growth
Clematis *Clematis* spp. **C. virginiana* is native	Yes and No*	spectacular flowers; some varieties bloom in spring others summer/fall; slow growth; prune spring bloomers 1 month after blooming; summer/fall bloomers in early spring; repeat bloomers available; corrective pruning in early spring
Climbing Hydrangea *Hydrangea paniculata*	No	abundant flat white flower clusters; climbs high, clings with aerial rootlets
Grape *Vitis* spp.	No	edible fruit; self-pollinating; fruit produced on stems from previous season; requires considerable attention to care and pest management
Hardy Kiwi *Actinidia* spp.	No	edible fruit; most female varieties need male varieties for pollen; fragrant white flowers
Trumpet Honeysuckle *Lonicera sempervirens*	Yes	blooms late spring into summer; showy orange-yellow to scarlet flowers attract hummingbirds; **avoid** invasive Japanese Honeysuckle
Virginia Creeper *Parthenocissus quinquefolia*	Yes	bright red fall foliage; berries attract birds; safe on brick & stone; may damage wood siding

For information on fruit-bearing vines, see the Cornell Guide to Growing Fruit at Home. This publication is available online or may downloaded. See http://www.hort.cornell.edu/gardening/fruit/homefruit.html.

Caution: Evergreen vines, such as English Ivy, should be avoided for shade because their leaves block out the warming sun in winter. English Ivy should also be avoided because it is invasive.

Groundcovers

The temperature a few inches above turf grasses and other groundcover plants is frequently 12 to 15 degrees F. lower than above asphalt, concrete, stone and other impervious surfaces. Planting groundcovers between homes and paved areas, such as walks, patios and drives, reduces summer temperatures. The inventory of groundcover plant material is extensive, and there several possibilities for each different kind of site (dry slopes, moist low areas, sunny locations, dry or moist shade and so on. Call CUCE-Rockland Horticulture Diagnostic Lab for turf and other groundcover recommendations.

Winter Benefits

Landscape plants can deflect cold winds away from the home, reduce wind speeds, provide dead air space along walls for added insulation, allow the sun to warm walls and control drifting snow. Evergreens are most effective for windbreaks and insulating foundation plantings. Deciduous trees that shelter homes from summer heat allow the sun's rays to warm a home in winter. During the winter, the bare branches allow sunlight to filter through to warm and light the home.

Wind and Windbreaks

Windbreaks for winter climate control can reduce fuel consumption by 10 to 25 percent. Windbreaks work by reducing wind velocities and deflecting wind movement to minimize air infiltration into the house. Windbreaks of living plants allow some wind penetration which makes them more effective than impenetrable windbreaks, which create a strong vacuum on the downwind side thus reducing protection.

Windbreak effectiveness is determined by proper site location, length of windbreak, number of rows of plants, types of plants, mature height of plants, prevailing wind speeds and proper maintenance.

- Windbreaks should be planted to the north and northwest of the home because prevailing winter winds are from the north and northwest.
- Windbreaks should extend to the ground. Pines are well adapted for windbreaks, but as they mature, the lower branches die out. This problem can be overcome by planting an understory of evergreen shrubs, such as holly, Mountain Laurel or Leocothoe, as pines drop lower branches.
- Space permitting, windbreaks should extend 50 feet beyond each corner of the area in need of protection. L or U shapes are most effective. Windbreaks work efficiently when they are 11.5 times longer than the mature width.
- The width of the planting is important as it relates to penetrability. Two to three rows of staggered evergreens are most effective in diverting winds. For deciduous materials, four or five staggered rows are necessary.
- The width of the effective area of the windbreak is important because it affects drifting snow on the downwind side. The goal is to keep drifting snow away from the house or driveway. The effective width is at a distance five to seven times the height of the trees. For example, a 10 foot tall windbreak will reduce the wind 50 to 70 feet to the downwind side while one that is 25 feet tall should be located 125 to 175 feet away.
- The width of the windbreak should be planted with trees and shrubs of varying heights to create rough windbreak edges.

Foundation Plantings

Dense evergreens planted four to five feet from the foundation wall shield the house from the wind and create a dead air space between the wall and the plants. Thus, foundation plants provide some insulation in addition to their aesthetic value of anchoring the house to the landscape. To be effective, the foundation planting must be dense to form a solid wall. Foundation plants can also shade outdoor air conditioning coils, however, the planting should not obstruct air flow or service access. Check the mature height of the species and varieties you choose in order to avoid future pruning problems.

Windbreak Trees	Native	Mature Height	Windbreak Trees	Native	Mature Height
American Holly *Ilex opaca*	Yes	40-50’	Eastern White Pine *Pinus strobus*	Yes	50-80’
Atlas Cedar *Cedrus atlantica*	No	40-60’	Japanese Black Pine *Pinus thumbergiana*	No	20-80’
Eastern Arborvitae *Thuja occidentalis*	Yes	50-75’	Leyland Cypress x *Cupressocyparis leylandii*	No	60-70’
Colorado Blue Spruce *Picea pungens* *Western US	Yes*	30-60	Norway Spruce *Picea abies*	No	40-60’
Douglas Fir *Pseudotsuga menzii* * Western US	Yes*	60-80’	Red Pine *Pinus resinosa*	Yes	50-80’
Eastern Red Cedar *Juniperus virginiana*	Yes	50-75’	White Spruce *Picea glauca*	Yes	40-60

Foundation Shrubs	Native	Mature Height	Foundation Shrubs	Native	Mature Height
Alberta Spruce *Picea glauca* var. *albertiana*	Yes	4-6’	Juniper (low growing or pruned) *Juniperus* spp. **J. horizontalis* is native; *J. communis* contains native types	Yes and No*	1-30’
Andromeda (Bog-Rosemary) *Andromeda polifolia*	Yes	1-2’	Leucothoe *Leucothoe fontanesiana*	Yes	2-6’
Azalea *Rhododendron* spp.	No*	4-8’	Mountain Laurel *Kalmia latifolia*	Yes	7-15’
Bird’s Nest Spruce *Picea abies* ‘Nidiformis”	No	3-5’ (10’ spread)	Northern Bayberry *Myrica pensylvanica*	Yes	4-8’
Boxwood *Buxus spp.*	No	3- 5’	Pieris (sometimes called Andromeda) *Pieris japonica*	No.	9-12’
Canadian Yew *Taxus Canadensis*	Yes	3-6’	Rhododendron **Rhododendron carolinianum* and *R. catawbiensis* are native	Yes and No*	6-10’
Inkberry Holly *Ilex glabra*	Yes	6-8’			

Plant and Site Selection

Trees and shrubs are investments. To gain the full benefits of your investments, it is important to select the right plant for the site, plant correctly in well prepared soil, mulch and properly water, especially through the first three growing seasons. Once established, trees and shrubs require little, if any, supplemental watering but they do benefit from renewed and expanded mulched areas as they grow because root systems reach up to three times beyond the canopy spread.

Before buying, consider the size of nursery stock. It is tempting to buy large plants to instantly gain the energy saving benefits of trees and shrubs. Small is usually the better choice. Small plants cost less. Small plants generally experience less transplant stress, grow more quickly and are healthier than larger plants. Small plants often surpass the size of the larger plant in a few years. Some tree species grow more quickly than other species, but if you want shade as soon as possible, it is better to pay more for a quality tree that will mature to a large size than to buy a fast-growing but short-lived or weak-wooded one. Trees with slow to moderate growth rates tend to live longer and have stronger wood that is less susceptible to breakage. For planting guidelines, call CUCE-Rockland Horticulture Diagnostic Lab.

When selecting a site for trees, check out overhead utility lines. The trunk and branches of a mature tree should be at least 10 feet away from overhead power lines. Also consider underground conditions: whether or not you have adequate soil volume or area to support mature trees. Before you get started, call Dig Safe NY at 1-800-962-7962 to locate and protect any underground utilities, three to ten days before you plan to plant. The service will contact all member utilities to mark the locations of underground facilities at no charge. If you have a septic tank, locate and steer clear of its lines.

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Resources:

Cool Roofs/Light Pavements. http://www.coolcommunities.org 1/30/2009

Cornell University Cooperative Extension 2009 Home Gardening—Lawn Care Library—Watering. http://www.gardening.cornell.ed/homegardening/scene7866.html

Department of Environmental Protection, Montgomery County, Maryland. Energy Efficient Landscaping: Energy Wise Homes—Winter Edition.

Department of Environmental Protection, Montgomery County, Maryland. Shady Ideas for Home Landscaping.

Halpin, A. (ed.) 2001 Sunset Northeastern Garden Book. Menlo Park, CA: Sunset Books

Starbuck, C. J. 2000 Landscape Plantings for Energy Savings. G6910. University Extension, University of Missouri—Columbia
Welch, W. C. Landscaping for Energy Conservation. AgriLife Extension. Texas A & M University. http://aggie-horituculture.tamu.edu/extension/homelandscape/energy/ener... 1/27/2009

For more information on reducing home energy consumption, contact NYSERDA (New York State Energy Research and Development Authority) http://www.getenergysmart.org/default.aspx, US Department of Energy EERE http://www.energysavers.gov/, your Customer Service Representative at Orange and Rockland Utilities Co. at the telephone number listed on your utilities bill. Or in New York call 1-800-422-6230.

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