

# Landscaping to Reduce Heating and Cooling Costs

## Trees and Vegetation in the Urban Landscape



Trees and other plants help cool the environment, making vegetation a simple and effective way to reduce urban heat islands and reduce building heating and cooling costs.

Trees and vegetation are most useful as a mitigation strategy when planted in strategic locations around buildings or to shade pavement in parking lots and on streets. Researchers have found that planting deciduous trees or vines to the west is typically most effective for cooling a building, especially if

## Resources

U.S. Environmental Protection Agency. Reducing Urban Heat Islands: Compendium of Strategies. Trees and Vegetation.

<http://www.epa.gov/heatisld/resources/pdf/TreesandVegCompendium.pdf>

<http://www.epa.gov/heatisld/mitigation/trees.htm>

University of Minnesota. Sustainable Urban Landscape Information Series. <http://www.sustland.umn.edu/design/energysaving.html>

U.S. Department of Energy. Energy Efficiency & Renewable Energy. Energy Savers. Landscape Shading. [http://www.energysavers.gov/your\\_home/landscaping/index.cfm/mytopic=11940](http://www.energysavers.gov/your_home/landscaping/index.cfm/mytopic=11940)

## Shading

Leaves and branches reduce the amount of solar radiation that reaches the surface thus reducing surface temperatures. This in turn reduces the heat transmitted into buildings and the atmosphere. Shaded surfaces, for example, may be 20–45°F (11–25°C) cooler than the peak temperatures of unshaded surfaces. In the summer, generally 10 to 30 percent of the sun's energy reaches the surface below a tree, with the remainder being absorbed by leaves and used for photosynthesis, and some being reflected back into the atmosphere. In winter, generally 10 to 80 percent of sunlight is transmitted through a tree. Evergreen trees transmit less where as deciduous trees transmit more because they lose their leaves in winter.

## Evapotranspiration

Trees and vegetation absorb water through their roots and emit it through their leaves; this is called “transpiration.” A large oak tree, for example, can transpire 40,000 gallons of water per year. Evaporation, the conversion of water from a liquid to a gas, also occurs from the soil around vegetation and from trees and vegetation as they intercept rainfall on leaves and other surfaces. Together, these processes are referred to as evapotranspiration. Evapotranspiration cools the air by using heat from the air to evaporate water.

Trees and other large vegetation can also serve as windbreaks to reduce the wind speed in the vicinity of buildings.

## Benefits

The use of trees and vegetation in the urban environment brings a multitude of benefits:

- **Reduced energy use:** Trees and vegetation that directly shade buildings decrease demand for air conditioning.
- **Improved air quality and lower greenhouse gas emissions:** By reducing energy demand, trees and vegetation decrease the production of associated air pollution and greenhouse gas emissions. They also remove air pollutants and store and sequester carbon dioxide.
- **Enhanced stormwater management and water quality:** Vegetation reduces and slows down runoff and improves water quality by absorbing and filtering rainwater.
- **Reduced pavement maintenance:** Tree shade can slow deterioration of street pavement, decreasing the amount of maintenance needed.
- **Improved quality of life:** Trees and vegetation provide aesthetic value, habitat for many species, and can reduce noise.

[www.dcnr.state.pa.us](http://www.dcnr.state.pa.us)



**pennsylvania**  
DEPARTMENT OF CONSERVATION  
AND NATURAL RESOURCES