

Trees Make a Difference

Benefits of Urban Forestry

Presented by the Tennessee Urban Forestry Council

Categories: Shade, Pollution, Energy Conservation, Air Quality, Water Quality, Health, Social

Trees Provide Shade

- "If you plant a tree today on the west side of your home, in 5 years your energy bills should be 3% less. In 15 years the savings will be nearly 12%." —Dr. E. Greg McPherson, Center for Urban Forest Research
- "Landscaping can reduce air conditioning costs by up to 50 percent, by shading the windows and walls of a home." — American Public Power Association
- "Trees properly placed around buildings can reduce air conditioning needs by 30 percent and can save 20 - 50 percent in energy used for heating."—USDA Forest Service
- "The net cooling effect of a young, healthy tree is equivalent to ten room-size air conditioners operating 20 hours a day."—U.S. Department of Agriculture

Trees Reduce Pollution

- absorbing the gaseous pollutants through leaf stomata during the normal exchange of gases.
- binding or dissolving water soluble pollutants onto moist leaf surfaces.
- intercepting and storing larger particulates on outer leaf surfaces, the epidermis, which may be waxy, resinous, hairy, or scaly.
- capturing and storing particulates on the uneven, rough branch and bark surfaces.
- sequestering CO₂ aboveground in woody tissue and belowground in the roots.
- lowering local air and building temperatures through transpiration, shading, and reducing winter wind infiltration, thus lessening the demand for cooling and heating and the formation of ozone. (USDA Flyer – Reducing Air Pollution)

Trees Provide Energy Conservation

Did You Know? More than half of a building's heat gain in summer or winter comes from sunlight shining through windows.

Trees Conserve Energy By:

- Shading which reduces the amount of sunlight (radiant energy) absorbed and stored by built surfaces;
- Evapotranspiration which converts liquid water in leaves to vapor, thereby cooling the air.
- Reducing the velocity of wind, which slows the infiltration of outside air into inside spaces.

A large front yard tree can provide the following benefits each year:

- Saves \$29 in summertime air conditioning by shading the building and cooling the air (250 kWh), about 9% of a typical residential building's total annual air conditioning cost.
- Absorbs 10 lbs. of air pollutants, including 4 lbs. of ozone and 3 lbs. of particulates.
- Intercepts 760 gal of rainfall in its crown, thereby reducing runoff of polluted storm water and flooding.
- Cleans 330 lbs. of CO₂ (90 lbs. C) from the atmosphere through direct sequestration in the tree's wood and reduced power plant emissions due to cooling energy savings.
- Adds about 1% to the sales price of the property, or about \$25 each year when annualized over a 40-year period.

Trees and Air Quality

- Over a 50-year lifetime, a tree provides \$62,000 worth of air pollution control. (USDA Forest Service Pamphlet #R1-92-100)
- There is up to a 60% reduction in street level particulates with trees. (Coder, Dr. Kim D., ["Identified Benefits of Community Trees and Forests"](#), University of Georgia, October, 1996).
- In one urban park (212 ha.) tree cover was found to remove daily 48lbs. particulates, 9 lbs nitrogen dioxide, 6 lbs sulfur dioxide, and 2 lb carbon monoxide (\$136/day value based upon pollution control technology) and 100 lbs of carbon. (Coder, Dr. Kim D., ["Identified Benefits of Community Trees and Forests"](#), University of Georgia, October, 1996.)
- One sugar maple (12" DBH) along a roadway removes in one growing season 60mg cadmium, 140 mg chromium, 820 mg nickel, and 5200 mg lead from the environment. (Coder, Dr. Kim D., ["Identified Benefits of Community Trees and Forests"](#), University of Georgia, October, 1996.)
- Planting trees and expanding parklands improves the air quality of Los Angeles county. A total of 300 trees can counter balance the amount of pollution one person produces in a lifetime. (McAliney, Mike. Arguments for Land Conservation: Documentation and Information Sources for Land Resources Protection, Trust for Public Land, Sacramento, CA, December, 1993)
- Absorbs 10 lbs of air pollutants, including 4 lbs of ozone and 3 lbs of particulates. The value of pollutant uptake by the tree is \$45 using the local market price of emission reduction credits. Uptake of NO_x by the tree is equivalent to NO_x emitted by a typical car driven 3,600 miles. (Greg McPherson)

- 100 trees remove five tons of CO₂ per year (Sacramento Tree Foundation)
- 100 trees remove about 1000 lbs of pollutants per year, including:
 - 400 lbs of ozone and 300 lbs of particulates (Sacramento Tree Foundation)

Trees and Water Quality

- Trees as riparian buffers and waterbreaks reduce and slow stormwater runoff, trapping soil sediments, nutrients and other pollutants, thus preventing them from entering receiving bodies of water.
- Trees along waterways filter out sediment, nutrients and other pollutants that enter waterways.
- Trees reduce erosion of soil from fields, hills and stream banks and reduce water temperatures, protecting aquatic habitats.
- Trees allow rain to infiltrate the soil, reducing pollutants from runoff and recharging soil moisture and aquifers, which results in a more consistent quantity of potable water.
- Trees maintain groundwater and stream base flows.
- Trees trap airborne pollutants and particulate matter, thus preventing them from entering receiving bodies of water.
- Trees reduce volume and peak flow of stormwater runoff, and thus reduce flooding and the cost of constructing stormwater control infrastructure.
- Trees can be used to actively treat many forms of wastewater.
- Bioretention areas filled with trees utilize “green engineering” to delay or eliminate the need for municipalities to build costly underground stormwater containment facilities.

Trees and Health

- "In laboratory research, visual exposure to settings with trees has produced significant recovery from stress within five minutes, as indicated by changes in blood pressure and muscle tension."—Dr. Roger S. Ulrich Texas A&M University
<http://www.arborday.org/trees/benefits.cfm>
- Studies have shown that hospital patients with a view of trees out their windows recover much faster and with fewer complications than similar patients without such views.
- Trees filter asthma-causing pollutants from the air.
- Trees give us pleasant, shaded places to exercise.
- Urban trees reduce ultraviolet irradiance in their shade when they obscure both the sun

and sky when there is dense shade. *Grant, R.H., Heisler, G.M., Gao, W. 2002. Estimation of Pedestrian Level UV Exposure Under Trees. Photochemistry and Photobiology 75:4, pp. 369–376.*

- Two surveys of parents of children with Attention-Deficit/Hyperactivity Disorder have shown that performing activities in green settings can reduce the symptoms of AD/HD. In the subsequent, nation-wide study, activities such as reading or playing sports were reported as improving children's symptoms more when performed in outdoor green settings than in non-green settings. Faber Taylor, A., Kuo, F.E., & Sullivan, W.C. (2001). "Coping with ADD: The surprising connection to green play settings." *Environment and Behavior*, 33(1), 54-77. Kuo, F.E., & Faber Taylor, A. (2004). "A potential natural treatment for Attention-Deficit/Hyperactivity Disorder: Evidence from a national study." *American Journal of Public Health*, 94(9), 1580-1586.
- Sun protection should begin early in life and continue throughout adulthood. According to the American Academy of Dermatology it is estimated that we get 80% of our sun exposure in the first 18 years of life. Trees located on playgrounds and other outdoor play area can benefit children not only as a learning environment, but as a protector from the sun's harmful rays. Univ. of Illinois at Urban-Champaign/Landscape and Human Health Laboratory

Trees and Society

- Compared with buildings that had little or no vegetation, buildings with high levels of greenery had 48 percent fewer property crimes and 56 percent fewer violent crimes.
- Trees have the potential to reduce social service budgets, decrease police calls for domestic violence, strengthen urban communities, and decrease the incidence of child abuse according to the study. Chicago officials heard that message last year. The city government spent \$10 million to plant 20,000 trees, a decision influenced by Kuo's and Sullivan's research, according to the Chicago Tribune.
- Trees planted along major streets have a "traffic calming" effect, resulting in slower moving traffic with fewer accidents and less property damage.
- Trees are the only part of municipal infrastructure that appreciate in value each year, while roads, water mains, street lights and everything else depreciate in value.

To learn more about the benefits of Urban Trees go to
The Tennessee Urban Forestry Council's web site:
www.tufc.com -- Leading the way for greener cities and communities.