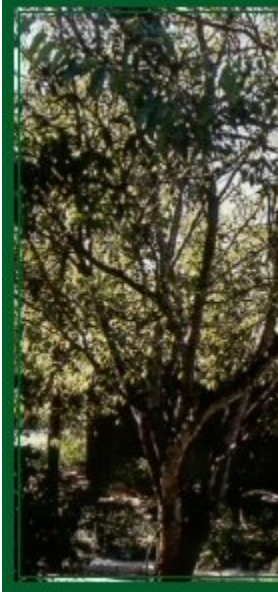




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Air Quality & Trees



Pollution Reduction

Perhaps the most well-known benefit of trees is their production of oxygen. Without it most life on earth, including humans, would cease to exist. Although sea plants probably produce most of the earth's oxygen, trees contribute significantly to the overall total. Researchers estimate that one acre of trees supplies the daily oxygen requirement for 18 people!

Not only do trees produce a beneficial gas like oxygen, they remove noxious gases as well. Nitrous oxide, sulfur dioxide, and ozone are important air pollutants which are absorbed by tree leaves. During transpiration, the leaves "suck in" or absorb these gases along with the needed carbon dioxide through stomata or "pores". A street without trees may have three to four times more air particulate pollution than a street with trees. Unfortunately, trees are not indestructible and frequently succumb to the continued assaults of air pollutants.

Ground-level ozone is an invisible but dangerous pollutant that is formed from other pollutants combining in the heat of the summer sun. The hotter it is, the more likely that ground-level ozone will form and build up to dangerous concentrations. Fortunately, trees help to cool off our scorching San Antonio summers. Just through their natural breathing processes, trees help to reduce the heat that helps to form lung-damaging ground-level ozone. (Source: of the Alamo Area Council of Governments.)

The final and perhaps the most important way in which trees affect air quality is by reducing particulate pollutants such as smoke, dirt, and heavy metals. Unlike gaseous pollutants, trees adsorb particulates onto their leaves, limbs, and trunks. This ability often produces dramatic results. One researcher estimated that a tree

lined street had four times less particulate pollution than a street without trees. In preparation for the 1984 Summer Olympics volunteers planted one million trees in Los Angeles. By the year 2005, these trees will be removing 200 tons of particulate pollution daily.

Source: Mark Peterson, San Antonio Water Service

Carbon Sequestration

Much has been said recently of the accumulation of carbon dioxide into the atmosphere and the potential for global warming. Because of the process of photosynthesis, however, trees offer the opportunity to mitigate some of the world's carbon dioxide output. For instance, studies show that for each cubic foot of wood produced in a tree, approximately 35 pounds of carbon are sequestered. As a result, American Forests, the oldest national citizen activist organization on behalf of forestry issues, has urged the planting of 100 million trees in urban areas by the year 2000. It is estimated that this would result in the sequestering of 6 to 10 million tons of carbon annually.

Furthermore, compared to rural trees, urban trees provide additional, albeit indirect, carbon sequestering benefits. When trees shade residences and businesses or provide protection against winter winds, the energy required to cool or heat these buildings is reduced. If fossil fuels are used to produce this energy, then a reduction in energy results in a reduction in atmospheric carbon. Consequently, urban trees are up to 15 times more efficient in reducing atmospheric carbon than rural trees.

Source: Mark Peterson, San Antonio Water Service

Water & Trees

Trees create organic matter on the soil surface from their leaf litter. Their roots increase soil permeability. This results in:

- Reduced surface runoff of water from storms.
- Reduced soil erosion and sedimentation in streams.
- Increased groundwater recharge that is significantly reduced by paving.
- Lesser amounts of chemicals transported to streams.

- Reduced wind erosion of soil.

Without trees, cities would need to increase sewage and storm water drainage channels and waste treatment capacities to handle increased water runoff.

Source: DDOT - Urban Forestry Administration, "Benefits of Urban Trees", <http://ddot.dc.gov/ufo/cwp/view.a,1293,q,575438.asp>

Storm Water Runoff Reduction & Trees

One of the benefits of trees which few realize is the reduction of storm water. A city with 30% canopy cover may reduce the runoff from a 1" rainfall by 17%. If canopy cover increases, the reduction in runoff similarly increases. Unfortunately, few strip centers or malls meet even the minimal levels for runoff reduction. This is truly disappointing since urban forests provide an economical, easy, and beautiful means to moderate flooding.

Natural vegetation such as forests and fields slow rainwater down, allowing it to soak into the surface. In contrast, streets, roofs, parking lots and manicured lawns, all provide hard, impervious, surfaces that prohibit rain from soaking into the ground. Since the excess rain water can not soak into the ground, it accumulates and rushes into storm sewers and waterways. (Source: City of Topeka Public Works Department.)

Storm water managers face two primary tasks: (1) channel the water so it does not flood homes, property, or city streets and (2) make sure the water is reasonably clean before it flows into natural streams, rivers, and lakes (Source: http://www.forester.net/sw_0203_trees.html).

Depending on the type of tree and the soil conditions (both the type of soil and its rain-saturation level), trees can absorb a considerable amount of water (Source: http://www.forester.net/sw_0203_trees.html). Also, water-polluting nitrates, phosphorus, and potassium, which in many areas are spurring the development of total maximum daily loads (TMDLs) for receiving waters, are readily absorbed by trees, which consider these substances food (Source: http://www.forester.net/sw_0203_trees.html).

Trees, likewise, reduce the amount of sediments, hydrocarbons, and other pollutants entering our creeks, rivers, and wetlands. Their fibrous root system retains soil and filters storm water quite

efficiently and also allows for greater percolation of rainfall.

According to the American Forests organization (www.americanforests.org), a healthy tree canopy can tremendously reduce storm water runoff, saving its host city millions of dollars in infrastructure costs.

Source: Mark Peterson, San Antonio Water Service

Energy Conservation & Trees

Everyone knows that trees provide shade but did you know trees actually cool the air. A single tree may provide as much cooling energy as five air conditioning window units. Putting it another way, a tree shading your home from afternoon sun may reduce room air temperatures by as much as ten degrees.

What does this information mean for you! Big energy bill savings is what! Imagine if you could cut your annual CPS bill by \$100. This is what a study in Alabama indicated, and that was in 1973 dollars!

Source: Mark Peterson, San Antonio Water Service

Trees Conserve Energy By:

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

Source: Gregg McPherson, Center for Urban Forest Research USDA Forest Service

Habitats & Trees

A habitat is a combination of food, water, shelter, and space arranged to meet the needs of wildlife. Even a small yard can be landscaped to attract birds, butterflies, beneficial insects, and small animals. (Source: United States Department of Agriculture, "Wildlife Habitat", <http://www.nrcs.usda.gov/feature/backyard/WildHab.html>.)

Trees provide habitat for birds and other wildlife. Specifically, they provide food, clean water, cover, and places to raise young for songbirds and other wildlife.



Conifers, also called evergreens, are trees and shrubs that do not lose their needles in winter, and stay green throughout the year. Larch is an exception because it is a conifer that loses its needles. Evergreens are extremely important to wildlife because they provide shelter in rain, heat, and harsh winter weather. During all seasons, they are cover for escaping predators. They block wind for feeding areas when placed on a windward side. In summer, they are used as nesting sites. The sap, needles, twigs, buds and seeds, and insects that make their homes in evergreens, are food for wildlife. Cavities in the trees are often used for nesting, roosting and shelter. (Source: University of Maine Cooperative Extension, "Components of a Backyard Wildlife Habitat", <http://www.umext.maine.edu/onlinepubs/htmlpubs/habitats/7137.htm>.)

Local Climate & Trees

Everyone has experienced walking across an asphalt road on a hot summer day. Multiply this by an entire city and the result is known as a "heat island". Researchers at the Lawrence Berkeley Laboratory estimate that ambient air temperatures in urban centers average five to ten degrees hotter than those in rural areas. Many

believe the heat island effect to be as detrimental to the climate as greenhouse gas accumulation.

Trees mitigate the heat island effect in two ways. First, trees shade urban structures, thus preventing the absorption of solar radiation. Second, evapotranspiration acts as a natural air-conditioner, cooling the surrounding air.

This cooling action is particularly important for the reduction of urban air pollution since high temperatures generate 30% to 40% additional pollution. Ozone, in particular, dramatically increases as temperatures rise.

Source: Mark Peterson, San Antonio Water Service

Your Community & Trees

Not surprising to those of us who love trees, but researchers have discovered that trees can be medicinal. A study from the University of Delaware found that hospital patients placed in rooms with windows facing trees had shorter hospital stays, felt better mentally, and required fewer pain-killers. In another study, students stressed from taking exams felt much better after viewing slides depicting forested landscapes; those viewing urban scenes felt worse.

Heavy metals like lead and cadmium are known to cause severe health problems. Trees similarly reduce the level of these dangerous pollutants by absorbing them. One study estimated that a 12" diameter tree was able to absorb 60 mg of cadmium, 140 mg of chromium, 820 mg of nickel, and 5200 mg of lead in one year. The more trees a city has the more heavy metals are removed from the environment.

Besides cooling and cleansing the environment, trees add value to our property. A USDA Forest Service study found that trees increase property values on average 5 to 7%, sometimes as much as 20%. Other studies point out that shaded homes resell faster and for more than those without trees do. The increase in property value does vary from region to region and with individual developers and realtors, but the simple fact remains—trees equal money!

Source: Mark Peterson, San Antonio Water Service