

City of Tampa's Urban Forest *Removal of Air Pollution*



Air Pollution Removal and the Urban Forest

What are some of the most serious air pollutants affecting human health?

Some of the most common air pollutants in an urban environment are carbon monoxide (CO), nitrogen dioxide (NO₂), ground-level ozone (O₃), particulate matter (PM₁₀, particles less than 10 micrometers) and sulfur dioxide (SO₂). CO is a toxic gas that enters the atmosphere through the burning of fossil fuels (e.g. automobiles and power plants). NO₂ is a respiratory irritant that can cause serious health problems. It is also a contributor to the formation of ground-level ozone (smog). Smog is created when sunlight, NO₂ and other volatile organic compounds react with one another. Smog can cause many health problems including coughing and nasal congestion, irritating those who suffer from asthma and emphysema. Smog is also known to lead to eye and nose irritation, which can damage the membranes that protect the body against diseases. PM₁₀ causes health problems by penetrating the lungs when inhaled (Andreu et al. 2008a).

How can the urban forest help reduce air pollution?

One way trees remove gaseous air pollution is by direct uptake through their leaves during the process of photosynthesis. Once inside the leaf, gases may be absorbed by water to form acids or they may react with inner-leaf surfaces. Trees also remove pollution by intercepting airborne particles. Some particles can be absorbed into the tree, but most particles are retained on the plant surface. Particles remaining on the plant surface are often re-suspended into the atmosphere, washed off by rain, or dropped to the ground when the leaf and twig fall (Escobedo 2008). Consequently, vegetation is only a temporary retention site for many atmospheric particles.

Trees play a key role in lowering temperatures in urban areas by shading buildings and pavement. The hotter it is in the city the more likely it is that smog will form. Therefore shade produced by trees can translate to a cooler, cleaner city. An individual tree or shrub's ability to remove pollutants from the air is related to its canopy size and leaf area, and to the concentration of air pollutants nearby.

How much air pollution can the urban forest remove?

In 2007, it was estimated that Tampa's urban forest removed approximately 1,360 tons of pollution, with an estimated value of \$6.4 million. Two-thirds of the removed air pollution (900 tons) is attributed to the trees in Tampa's urban forest. The other one-third of air pollution removed (480 tons) is attributed to shrubs, highlighting the importance of the urban forest as a whole.

Tonnage and associated dollar values for pollutants removed by trees and shrubs in Tampa, 2007.

	Pollutant	English (short) tons	US Dollars
Trees	CO	70	\$57,370
	NO ₂	50	\$318,660
	O ₃	460	\$2,796,010
	PM ₁₀	210	\$855,140
	SO ₂	110	\$165,770
Shrubs	CO	30	\$27,570
	NO ₂	30	\$167,740
	O ₃	240	\$1,446,730
	PM ₁₀	120	\$469,240
	SO ₂	60	\$84,370
Total		1380	\$6,388,600

