

Air Pollution Removal and the Urban Forest

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

Some of the most serious air pollutants in an urban environment are carbon monoxide (CO), nitrogen dioxide (NO₂), ground-level ozone (O₃), particulate matter (PM₁₀) 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 an ingredient in the formation of ground-level ozone (smog). Smog can cause many health problems including, coughing and nasal congestion, irritating those with 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. Smog is created when sunlight, NO₂ and other volatile organic compounds react with one another. PM₁₀, particles less than 10 micrometers, are other air pollutants that cause health problems by penetrating the lungs when inhaled.

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 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. 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. Since the formation of smog can be correlated to increased urban temperatures, the shading affect of trees can promote a reduction in the rate of ground-level ozone formation, or smog. An individual tree or shrub's ability to remove pollutants from the air is related to its canopy size and overall vigor.

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 \$6.3 million dollars. Two-thirds of the removed air pollution (894 tons) is attributed to the trees in Tampa's urban forest. The other one-third of air pollution removed (466 tons) is attributed to shrubs, highlighting the importance of the urban forest as a whole (Table 1).

	Pollutant	English (short) tons	US Dollars
Trees	CO	66	\$57,367
	NO ₂	52	\$318,661
	O ₃	456	\$2,796,010
	PM ₁₀	209	\$855,141
	SO ₂	111	\$165,773
Shrubs	CO	32	\$27,570
	NO ₂	27	\$167,738
	O ₃	236	\$1,446,730
	PM ₁₀	115	\$469,239
	SO ₂	56	\$84,366
Total		1360	\$6,388,595

Table 1: Tonnage and associated dollar values for pollutants removed by trees and shrubs in Tampa, 2007.

