

Environmental Benefits

2024

Overview

Trees, green spaces, and nature provide crucial environmental benefits to urban areas such as reducing air pollution, addressing heat island effect, providing critical habitat, and mitigating numerous climate change impacts.

Interesting Information

Air Pollution

- Trees and vegetation can improve air quality by removing pollutants and reducing air temperature, both of which contribute to smog. They also reduce energy needs for cooling, reducing the associated pollutant emissions from power plants.
- Trees absorb pollutants like nitrogen oxides, ammonia, sulfur dioxide, and ozone, effectively purifying the air. Leaves also capture dust and smoke particulates (*Green Canopy, Better World: Exploring the Benefits of Trees*, n.d.).
- Air quality benefits significantly impact respiratory illnesses. Nowak (2014) found that trees removed 17.4 million tons of air pollution across the United States, which prevented 850 human deaths and 670,000 cases of acute respiratory symptoms. The human health effects associated with this pollution removal were valued at 6.8 billion dollars (about \$21 per person in the US).

Reduce Greenhouse Gases

- Up to 60 billion new trees could be planted by 2040 if suitable land is used without reducing food production. These trees could remove up to 540 million tons of carbon dioxide annually from the atmosphere, equivalent to nearly 10% of the country's net greenhouse gas emissions (Rudee, 2020).
- Approximately 1.83 billion trees are planted globally each year. That's a substantial effort to restore and expand green spaces. This translates to around 58 trees planted every second (McInerney, 2024).
- Trees don't just mitigate carbon, removing it from the atmosphere, they also sequester it – absorbing carbon dioxide during photosynthesis and then locking it up for centuries. Research has shown that urban trees in the United States sequester some 22.8 million tons of carbon each year (The Morton Arboretum, 2024).

Cooling

- Cities are generally warmer than surrounding agricultural and forested areas due to the dominance of impervious surfaces and the fact that urban materials absorb and hold heat. This is called the urban heat island effect. Urban forests and green roofs can aid in reducing urban heat island effects (Wolf et al., 2015).

- Parks can be up to 2°F cooler than the surrounding urban area in the day. Large numbers of trees and expansive green spaces across a city can reduce local air temperatures by up to 9°F (Wolf et al., 2015).
- Low-income neighborhoods have on average 26 percent less tree cover and are 7°F hotter. Neighborhoods with the highest concentration of people of color—regardless of income—have on average 38 percent less tree cover and are 10 degrees F hotter (Daley, 2023).
- Heat is the leading cause of death from extreme weather in the United States, with research led by Duke University projecting that climate change could increase this to nearly 100,000 heat-related deaths per year by 2100 (Daley, 2023).
- A tree can cool the area underneath it by as much as 45 degrees F and studies have found trees can reduce cooling load in a home by more than 50 percent when placed in the right locations (Daley, 2023).

Water Conservation, Quality and Flooding

- Climate change is impacting the frequency and severity of flooding in our communities. Trees, green spaces, and nature play a vital role in reducing flooding by slowing down the flow of rainwater, absorbing rainwater and reducing erosion before hitting the ground (Woodland Trust, n.d.).
- Rain hits the ground at higher speeds where there is a lack of tree cover. A canopy of leaves, branches and trunks slows down the rain before it hit the ground and can spread the effect of a rainstorm and in turn allow some of the water to evaporate back into the atmosphere (Woodland Trust, n.d.).
- Root systems help water penetrate deeper into the soil at a faster rate under and around trees which mean less surface run-off, also preventing erosion (Woodland Trust, n.d.).
- Impermeable surfaces in urban areas increase run off. Trees reduce surface water run off by 80% compared to asphalt. Trees and soils improve water quality in that they can remove harmful substances washed off roads, parking lots, and roofs during rain or snow events (Wolf et al., 2015).
- The US Forest Service estimates that 100 mature trees intercept about 250,000 gallons of rainfall per year in their leafy crowns (The Morton Arboretum, 2024).

Biodiversity and Wildlife Corridors

- Trees are foundational to many ecosystems, supporting biodiversity. They provide habitat and food for countless species from canopy to forest floor (Gardenia, n.d.).
- Green spaces create wildlife corridors in cities essential for the survival of urban wildlife. They enable birds and insects to navigate through cities promoting ecological diversity in urban settings. They support biodiversity. Moths, birds, bats, dormice, butterflies, fungi depend on woods, trees and hedges to feed, breed and thrive (Gardenia, n.d.).
- Even small patches of genuinely biodiverse nature can re-invite and sustain multitudes of plant and animal species, as urban ecologists have shown (Woodland Trust, n.d.).

Resources

(EPA) National Stormwater Calculator (<http://www2.epa.gov/water-research/national-stormwater-calculator>) can be used to estimate annual stormwater runoff, based on site-specific information. Other tools are available from the

U.S. Department of Agriculture Forest Service tool to calculate ecosystem services provided by an urban forest canopy (if-Tree Eco; <http://www.itreetools.org/>) or by street trees (i-Tree Streets; <http://www.itreetools.org/streets/index.php>).

Tree Planting Statistics - <https://www.gotreequotes.com/tree-planting-statistics/>

References

Daley, J. (2023, November 17). America is making tree equity a climate solution for cities. *TIME*.

Gardenia (n.d.). *Green Canopy, Better World: Exploring the Benefits of Trees*. <https://www.gardenia.net/guide/green-canopy-better-world-benefits-of-trees>

Nowak, D. J., Hirabayashi, S., Bodine, A. R., & Greenfield, E. J. (2014). Tree and forest effects on air quality and human health in the United States. *Environmental Pollution*, 193, 119–129. <https://doi.org/10.1016/j.envpol.2014.05.028>

McInerney, B. (2024, April 11). *Tree planting statistics*. GoTreeQuotes. <https://www.gotreequotes.com/tree-planting-statistics/>

Rudee, A. (2020, February 12). *How and where to plant 60 billion trees in the US*. World Resources Institute. <https://www.wri.org/insights/how-and-where-plant-60-billion-trees-us>

The Morton Arboretum. (2024, April 12). *Benefits of trees | The Morton Arboretum* <https://mortonarb.org/plant-and-protect/benefits-of-trees/#environment>

Why we need trees: Trees help fight climate change, save wildlife, and improve our health. (n.d.). Woodland Trust. Retrieved April 24, 2024, from <https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/benefits/>

Wolf, K. L., & Robbins, A. (2015). Metro Nature, environmental health, and economic value. *Environmental Health Perspectives*, 123(5), 390–398. <https://doi.org/10.1289/ehp.1408216>