The Scientific Benefit of Trees for People

Overview

By 2050, an estimated 66% of the total world's population will be urban[1]. Urbanization, coupled with a changing climate, is a challenge on a global scale that greatly impacts the health and well-being of humans. In order to establish healthy and vibrant communities, trees need to be part of the global discussion. Over the past 30 years, science has demonstrated how trees in our landscapes benefit people and that well-maintained trees are an important asset to keep a community healthy and safe. Planting and maintaining trees, as part of urban planning and engineering solutions, can serve as a nature-based solution to many challenges communities face: managing stormwater, supporting mental and physical health for people, reducing crime, addressing pollution, and providing wildlife habitat. Despite the critical importance or urban forest, urban tree cover continues to decline nationwide each year [2].

Investing in trees through planting, care, and maintenance will produce a significant return on investments, especially as older and larger trees provide the most benefits[3]. Trees are a long-term solution for many issues people face and they are a valuable resource for every community, especially those in urban or suburban settings. Botanical gardens and arboreta play an important role in this pursuit for a healthy and vibrant urban forest. These institutions provide valuable insight and leadership due to their expertise in botany and horticulture, as well as an established track record of public outreach and training. The future of urban forestry should focus on protecting large trees, as well as improving age structure, standards and planning management.

While not comprehensive, this list provides an overview of the many scientific benefits that trees, and greenspace with trees, provide to people both directly and indirectly.

Trees have a high return on investment due to ecosystem services

Experts suggest that every dollar invested on tree planting and management can result in a high return on investment [4,5], even as high as over 500%[4]. The compensatory value of the urban forest in the continental US is estimated to be worth more than $2.4 trillion[6], with $18.3 billion worth of ecosystem benefits occurring annually[7]. Trees and greenspace provide important direct and indirect benefits social and biological benefits [8,9], such as:

- Reducing stormwater runoff [10–12]
- Reducing air and water pollution[13–17]
- Reducing energy costs and use associated with heating and cooling[18–21]
- Reducing the urban heat island[22]
- Protecting roadways and reducing the amount of asphalt sealers required [23]
- Reducing noise pollution[24]
- Providing valuable carbon storage and sequestration [25,26]
- Increasing food security of urban areas [27,28]

Trees stimulate the local economy

The presence of well-cared for trees encourages shoppers to spend more time at a business district, and they will travel a greater distance to visit that center, research has shown. Further, shopping areas with trees are more likely to be ranked as being more comfortable and having better upkeep, friendlier staff, and higher

quality products[29]. Additionally, having well-maintained trees along city streets and retail areas, as well as in residential areas can:

- Increase rental rates of business properties[30]
- Increase the sale price of a home[31–34]
- Decrease the time a house is on the market[34]

Trees keep citizens healthy and happy

The presence of trees and green space on people can:

- Increase attention, memory,[35,36], reflection[37] and focus[38]
- Reduce stress[39] or increased ability to recover from stress[40]
- Increase life satisfaction[41] and positive thoughts or emotions[42–44]
- Lower mortality rates from non-accidental deaths[45–47]
- Shorten recovery times in the hospital[48] and increased perception of health[49]
- Increase physical activity[50]
- Reduce diastolic blood pressure[51]

Children and students benefit from the presence of trees, which can:

- Reduce symptoms of attention deficit disorders[52,53] and increase attention[54,55]
- Increase in classroom engagement[56]
- Improve test scores in reading and mathematics[57]
- Improve the mood of teenagers and lower their emotions of depression, anger, and fatigue[58]
- Increase self-discipline, impulse inhibition, and concentration in young girls[54]
- Improve physical health[59]

Trees encourage a sense of community and keep people safe

Trees evoke positive strong emotions in people[60]. Urban residents *value* trees [61] and people like looking at trees[62]. Well-maintained trees can reduce crime in a neighborhood. In fact, the loss of trees in neighborhoods due to pest infestation has been positively associated with increases in crime[63].

This phenomenon of trees reducing crime rate has been observed in numerous studies:

- Well-maintained trees are related to lower crime rates[64–66]
- A green view from a home can lower aggression and violence in that home[67]
- Well-maintained trees are related to reduced property crimes and violent crimes[68]

Trees encourage people to gather in common outdoor space, causing:

- Increased social capital[69,70] and ultimately increased supervision of children[71]
- Increased sense of community and safety[69,72,73]

Large, old trees provide the most benefit

Large, old trees are critically important worldwide from an ecological and cultural perspective[3]. Despite their importance, these trees are declining globally[74]. While trees in natural environments can survive for 100's of years, the half-life of an inner street tree is 10 to 15 years[75]. It is difficult to develop a universal definition for a large, old tree[3], largely given the diversity of tree species worldwide[3,76], so there are limited management and conservation plans[3]. Nevertheless, emphasis must be made to preserve large, old trees as they provide numerous benefits[3], especially in urban environments[77]. Once large old trees are lost from the community, it is difficult if not impossible to replace their cultural and ecological function [3].

Large trees provide critical benefits for their role in:

- Creating habitat for other species[3,77,78]
- Managing important environmental cycles and processes [3]
- Storing and sequestering significant amounts of carbon[79]

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