

From the U.S. Forest Service and Partners

Sustaining Human and Community Health through Urban Forestry

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INTRODUCTION

Arborists and urban foresters are in the tree business for many personal reasons. Working to build and maintain the tree canopy brings us joy in our service to communities. A healthy tree spreading its beauty and shade on a hot summer day reminds us why we are in this profession, especially when we see people cooling off underneath. Recent studies and findings from the Forest Service have expanded our understanding of the importance of the many benefits that city trees provide. In our gut we knew these to be true, but now we have the science to back it up—and these findings reinforce the value of our service and validate our choice to work in this field.

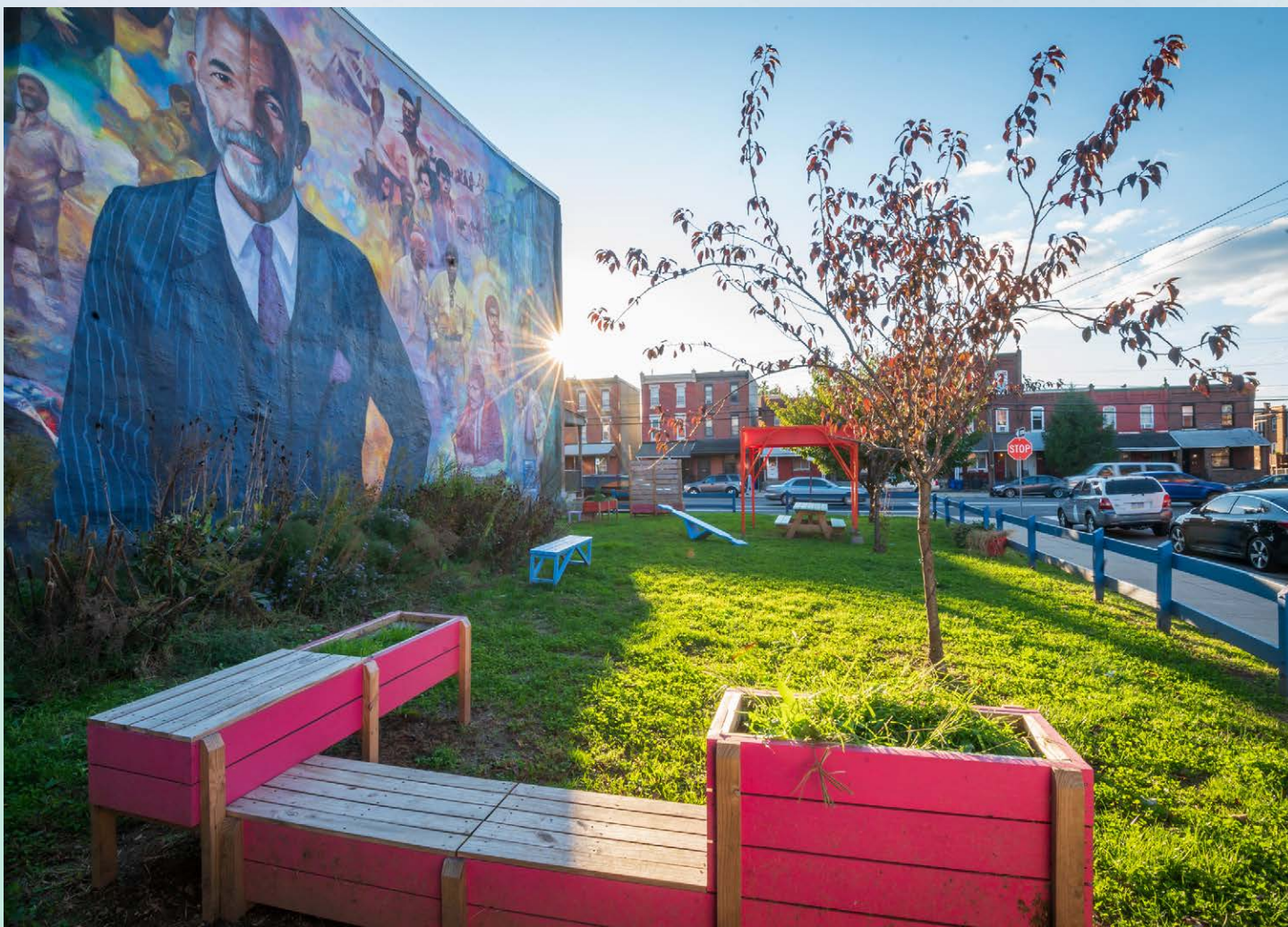
Urban forests and the human immune system

Greenspace can improve human health in a range of ways. For example, by improving air quality, reducing stress, and increasing physical activity. However, recent research suggests that greenspace may also improve health by improving immune function. This is consistent with the biodiversity hypothesis, which posits that global loss of biodiversity is contributing to increased incidence of immune diseases especially in high-income countries (Haahtela et al. 2013). Strictly speaking, trees and plants do not directly influence human immune function. Rather, it is the microbes that live on plant leaves that help our immune systems mature. While the link between plants and human immune function is still being explored, we know that exposure to

other sources of microbes—attending day care or having older siblings, for example—makes children less susceptible to immune diseases (Strachan 1989). To date, research has shown that children that are exposed to greater plant diversity are at lower risk of developing immune diseases including asthma and childhood leukemia (Donovan et al. 2018; Donovan et al. 2021).

Residential greenness and asthma

About 1 in 12 children in the US suffer from asthma. Although we have medications that can treat symptoms, we do not have any public-health interventions that can cure or prevent the disease. However, emerging evidence suggests that exposing children to greenspace, especially biodiverse greenspace, may help protect children



The Pennsylvania Horticultural Society (PHS) LandCare program, in collaboration with community members, turned a vacant lot into the Ed Bradley Community Oasis in West Philadelphia. Photo Courtesy of Pennsylvania Horticultural Society

against asthma (Donovan et al. 2018). We're not exactly sure how greenspace protects children, but we suspect that the microbial communities on the leaves of trees and plants helps children's immune systems develop properly, so that they are less likely to develop immune diseases like asthma. This finding is consistent with research showing that other sources of microbial exposure help protect children against asthma. For example, having older siblings, going to day care, and growing up on a farm are lifestyle traits that may reduce the likelihood of childhood asthma (Douwes et al. 2008; Strachan 1989). Although these findings help us understand the potential causes of the disease, it's unreasonable to expect related public-health interventions – these lifestyle traits are outside the realm of a physician's medical guidance. In contrast, it may be relatively easy to increase a child's exposure to diverse greenspace.

Greening, greenspace, morbidity, and mortality

Cities across the world are undertaking ambitious projects to expand tree canopy by increasing the number of trees planted throughout public and private spaces. Evidence suggests that an increase in tree canopy or green space could decrease sickness and death in urban populations (Rojas-Rueda et al., 2019). In the case of Philadelphia, for example, Forest Service scientists, with collaborators, conducted a Greenspace-Health Impact Assessment to estimate the annual premature mortality burden for adult residents associated with projected changes in tree canopy cover under the city's 2009 plan called Greenworks Philadelphia (Kondo et al., 2020a). Between the years 2016-2025, using up-to-date exposure-response functions in the tool, the number of >>

preventable annual premature deaths were calculated city-wide and for areas of lower versus higher socioeconomic status (SES). It was estimated that 403 premature deaths overall, including 244 premature deaths in lower SES areas, could be prevented annually in Philadelphia if the city is able to meet its goal of increasing tree canopy up to its goal of 30%. Bringing all of Philadelphia, and especially its poorer neighborhoods up to the 30% goal is not without challenge. Nevertheless, policymakers were encouraged in valuing urban greening efforts as health-promoting and life-saving measures.

Green space improvement, crime, fear and safety

Vacant and blighted urban land is a widespread and potentially risky environmental condition encountered by millions of people on a daily basis. About 15% of the land in US cities is deemed vacant or abandoned, translating into an area roughly the size of Switzerland – over 9 million acres of otherwise beneficial spaces that remain neglected. To study whether the greening of vacant urban land reduces the frequency of violence and crime as well as perceptions of fear and safety in communities, a randomized controlled trial was conducted in Philadelphia using standardized landscape treatments (Branas et al. 2018). A total of 541 randomly sampled vacant lots were allocated into treatment and control sites, and 445 randomly sampled participants were surveyed over a 38-month study period. It was discovered that participants living near treated vacant lots reported significantly reduced perceptions of crime, vandalism, and safety concerns when going outside their homes, as well as significantly increased use of outside spaces for relaxing and socializing (Branas et al. 2018). They also reported significantly reduced symptoms of depression and feelings of worthlessness (South et al. 2018). In addition, there was significant reduction in crime overall (-13.3%), gun violence (-29.1%), burglary (-21.9%), and nuisances (-30.3%) after the treatment of vacant lots in neighborhoods below the poverty line. This study helped to determine that blighted and vacant urban land affects people's perceptions of safety as well as their actual, physical safety. Restoration of vacant urban land can be an effective and scalable infrastructural intervention to significantly reduce persistent urban problems such as gun violence, crime and fear.



The Tioga Hope Garden in the Nicetown-Tioga neighborhood of Philadelphia is part of the program, which, with community input and collaboration, has transformed many vacant lots in Philadelphia into green spaces. Photo Courtesy of Pennsylvania Horticultural Society

Tree planting and gentrification

Several studies have shown that trees can increase the sales and rental price of homes (Donovan and Butry 2010; Donovan and Butry 2011). This is not surprising, given the wide range of benefits that trees provide. However, if trees increase home values, then they may also displace long-term residents who can no longer afford to live in a neighborhood as the sales and rental prices of homes go up. This process is known as gentrification. Several studies have shown that major changes to a neighborhood's natural amenities, such as adding a park, can cause gentrification (Anguelovski et al. 2017; Curran et al. 2012). It's not clear whether smaller changes to a neighborhood's natural amenities, such as tree planting, can also gentrify. To answer this question, scientists analyzed 30 years of tree-planting data in Portland, Oregon. They found evidence that



is a project of the PHS LandCare
more than 13,000 similar vacant
Agricultural Society

tree planting was associated with gentrification, and that the effect was modest and appeared around six years after planting (Donovan et al. 2022). The scientists cautioned that "... it would be short sighted to refrain from tree planting in under-privileged neighborhoods for fear of gentrification, as withholding tree benefits would compound the disadvantages that residents already face." (Donovan et al. 2022)

Nature prescriptions for health

Nature prescription programs have emerged to address the high burden of chronic disease and increasingly sedentary and screen-based lifestyles in the U.S. and around the world, including cardiovascular diseases, psychological distress and concomitants (e.g. obesity, loneliness, burn-out). A review of published literature by health-care



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Prescribe Outside is a nature prescription program at the Children's Hospital of Philadelphia, supported by the USDA Forest Service.

providers was completed recently, which summarized evidence of the effectiveness of nature prescription programs (Kondo et al. 2020b). The review assessed eleven studies which evaluated nature prescription programs that refer patients either to nearby parks or to formal outdoor activity programs. Several of these were empirical studies that evaluated a wide variety of health behaviours and outcomes among the most at-risk children and families. The authors determined that more research is necessary to understand how to measure and increase patient adherence, short and long-term health outcomes for patients and their families, and determinants of provider participation and participation impacts on providers' own health. The USDA Forest Service is supporting development of nature prescription programs, such as Prescribe Outside in Philadelphia (shown above), as well as research to establish short- and long-term impacts on resident, patient and physician health. >>

Conclusion

Our community of practice, focused on improving the quality of life for those who live in cities and towns, has been proven to have great influence through the planting and stewardship of trees. We continue to learn from this work and its impact, and expect to uncover many more benefits that will support and attract generations of new practitioners into our chosen profession. 🌿

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