

Northern Research Station

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“A Tree Grows in the City”: Improving Lives with an Urban Forest



Volunteers with Baltimore’s Parks & People Foundation plant trees on a city parking strip. (Reprinted with permission. Image credit: Beth Wanamaker).

The 1943 novel *A Tree Grows In Brooklyn* is one of those books that endures as a classic. This book about a struggling inner-city Irish-American family was not only a bestseller during the closing years of World War II, it was adapted into a movie, a musical, and a television pilot episode. More recently, the book was referenced in a song about city life called “Respiration” by the hip hop duo Black Star.

In the book, an especially persistent tree in an inner-city Brooklyn neighborhood

becomes a metaphor for overcoming poverty, addiction, and social exploitation. The tree belonged to a species commonly known as a Tree of Heaven (*Ailanthus altissima*)— “the only tree that grew out of cement,” as described in the book. This type of tree was used extensively as an urban U.S. street tree during the 1800s. And despite being considered invasive in recent years, these tenacious but smelly trees can still be found in many vacant lots in older U.S. cities.

What is it about this story that has

SUMMARY

Recent U.S. Forest Service studies in Baltimore and Philadelphia support the concept that landscape improvements and increased tree canopy in underserved neighborhoods can help residents develop a sense of community and increase positive neighborhood utilization of outdoor spaces – both of which have been seen to lower crime levels in test cases. The Forest Service’s Urban Field Stations are collaborating with city departments and nonprofit organizations to improve the quality of life in urban areas by working with communities to apply the research and make positive changes to the local environment. At the same time, cities are accomplishing related improvements, such as pollution reduction through stormwater infrastructure development and making underserved neighborhoods more vibrant and appealing.

remained socially relevant for more than 70 years? Perhaps it's the concept that, just as a tree can thrive in a harsh environment, so an individual or a family can overcome urban challenges to survive — and possibly even to triumph over adversity.

This connection between trees and improving lives in urban areas can be found in research conducted by scientists with the U.S. Forest Service's Northern Research Station. By researching the effects

“For me, this research is all about the relationship between the environment, public health, and crime and safety.”

*- Michelle Kondo,
research social scientist*

of newly planted trees on crime levels in inner-city Baltimore, Philadelphia, New York City, Chicago, and elsewhere, these scientists are helping urban managers identify ways to reduce crime and improve quality of life in some of the cities' underserved neighborhoods. These neighborhoods are typically older, industrial areas that have experienced significant population and job loss, resulting in high residential vacancy and reduced service capacity and resources.

TREES AND CRIME

Two of the U.S. Forest Service researchers who focus on this issue are Morgan Grove in Baltimore and Michelle Kondo in Philadelphia. Grove and Kondo research this issue from different perspectives: while Grove is a social ecologist, Kondo is an urban planner. According to Kondo, “For me this research

is all about the relationship between the environment, public health, and crime and safety. The idea that we can study it and quantify it really goes back to the Industrial Revolution. Cities and overcrowding and pollution and improving people's lives — that's where a lot of these ideas come from.” For Grove, the research has deep implications for society: “What I say to my students is, ‘Yes, a tree provides shade and is beautiful and beneficial to the ecosystem. But it also has social meaning: that people in this neighborhood look out for each other.’”

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Baltimore students help with their school's "greening" efforts with help from the Parks & People Foundation. (Reprinted with permission from Parks & People Foundation)

Another collaborator is Austin Troy, professor and chair at the University of Colorado Denver Department of Planning and Design and an expert on using spatial analysis to evaluate urban social and environmental conditions. Troy and Grove have worked together on research for more than 10 years, starting with a study on Baltimore parks and crime. During this study, Troy says, “It was very clear-cut that for homes that are near high-crime parks, the parks caused them to be lower in value. We saw that for some neighborhoods, parks had gone from being a positive amenity to being a negative amenity in terms of public perception of the neighborhood and property values.”

FRONT YARDS IN BALTIMORE

In a more recent study, Grove and Troy were part of a team that evaluated more than 1,000 Baltimore front yards. They examined more than 40 factors, called indicators, related to a yard's lawns, trees, shrubs, flowerbeds and other features. These indicators were related to crimes occurring within 150 meters. After controlling for income, population density, block-scale tree canopy and housing type, they found that well-maintained yards with clear lines of sight — such as those with lawns and yard trees — had lower levels of crime relative



to poorly maintained yards and yards with unmanaged vegetation that could conceal criminal activity. These findings have been a surprise to many.



Nearby residents gather to celebrate renovations and landscaping in south Philadelphia's Ralph Brooks Park. (Image source: Philadelphia Water)

“There had been a perception that vegetation was something that helped conceal criminals and criminal activity,” Troy said. “And while there’s a type of vegetation and landscaping that that’s true for, it was clear that trees in particular were instrumental in reducing crime. Trees get more people outside and so does pleasant landscaping, whether it’s in parks or front yards. The more elements of positive input you have, the lower the crime rate. The flip side is that the more signs of neglect you have, the safer criminals feel.” These findings add to a growing body of research that suggest that thoughtfully maintained landscaping may deter crime

by showing criminals that residents care about their neighborhood. Grove calls this “green courage” — “people feel better about working together when they see the changes happening in their neighborhood.”

SOCIAL IMPROVEMENT IN PHILADELPHIA

In another study, Kondo was part of a team that investigated the health and safety effects of urban green stormwater infrastructure improvements in Philadelphia between 2000 and 2012. The research approach involved using a treatment group — in this case, neighborhoods where improvements were made — and a control group comprised of “untreated” neighborhoods, or places where improvements had not yet been made, in the same city. Demographics, crime levels, housing types, and other factors were used to make sure that the treated and untreated neighborhoods were as similar as possible. In this study, Kondo and her team found that the treated neighborhoods had lower levels of narcotics possession, narcotics manufacturing and burglary.

According to Philadelphia police detective Hugh Davis, these treated neighborhoods often feel safer over time. “It often starts out as a grant program to make landscape improvements and then residents start to take ownership,” Davis says. “It improves

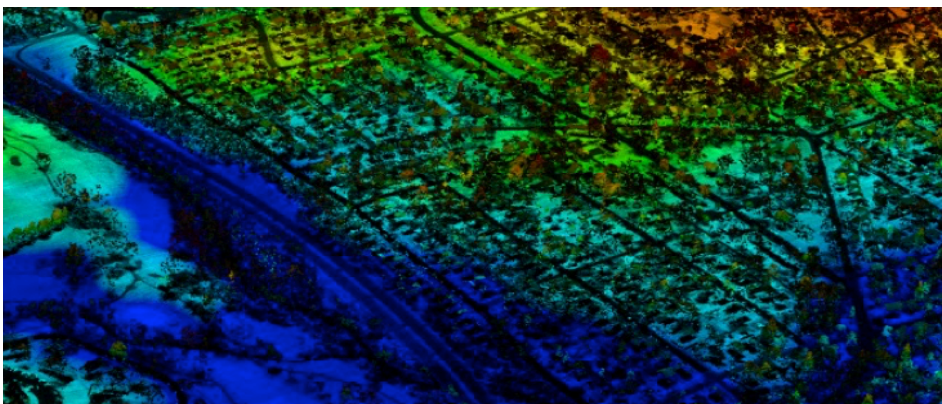


i-Tree software helps communities with tree management and advocacy efforts by quantifying tree coverage and trees’ environmental and economic value. (Image source: www.itreetools.org)

neighborhood pride and goodwill toward the city. You start seeing neighborhoods working together and participating in city programs like Philadelphia’s Clean Block contest.”

MAXIMIZING MODERN MAPPING AND ANALYTICS

Much of this neighborhood-level research relies on data provided by the University of Vermont’s Spatial Analysis Laboratory (SAL). According to SAL director Jarlath O’Neil-Dunne, a longtime collaborator with Grove and Kondo, “We specialize in taking all the wonderful aerial data that’s out there — both from satellites and from Lidar laser technology that provides a 3-D view — and we extract land cover information such as tree canopy coverage. Once you have that geographic data, you can integrate it with other data that’s available, such as crime locations. Having this level of information is really important for cities like New York with its Million Tree Initiative, because there you’ve got costs of well over \$1,000 to put a tree in the ground.” Integrating tree canopy maps with social data can help communities prioritize tree plantings to maximize both ecological and human health benefits.



The U.S. Forest Service uses 3-D Lidar images to map tree canopies in Baltimore and dozens of other locations around North America. (Image source: University of Vermont Spatial Analysis Laboratory)



WORKING WITH THE COMMUNITY

While research, mapping, and analytics are important pieces of the puzzle, so is what Kondo describes as “building partnerships and leveraging resources around the city.” Partnerships can be city departments and local nonprofits, while resources can include government programs such as the Baltimore Neighborhood Energy Challenge or Philadelphia Parks & Recreation’s TreePhilly initiative. In Baltimore, the Parks & People Foundation has been an especially proactive nonprofit partner. According to Valerie Rupp, the Foundation’s director of community greening, “People are taking back their neighborhoods: While crime still exists, there’s been a shift to more minor, less violent crimes.”

In Philadelphia, one key partner is the city’s water department, which is five years into a 25-year, \$2 billion “Green City, Clean Waters” plan to meet Clean Water Act standards and combat water pollution. According to Tiffany Ledesma, public engagement team manager at Philadelphia Water, “We’re using rainwater onsite as a resource rather than allowing it to overflow into our rivers with waste from our homes. So far we’ve had more than 1,000 projects and we’ve greened



A hopeful mural can be seen from an urban greening project in south Philadelphia. (Image source: Philadelphia Water)

more than 744 acres, which translates to more than 600 million gallons of combined sewer overflow reduction.”

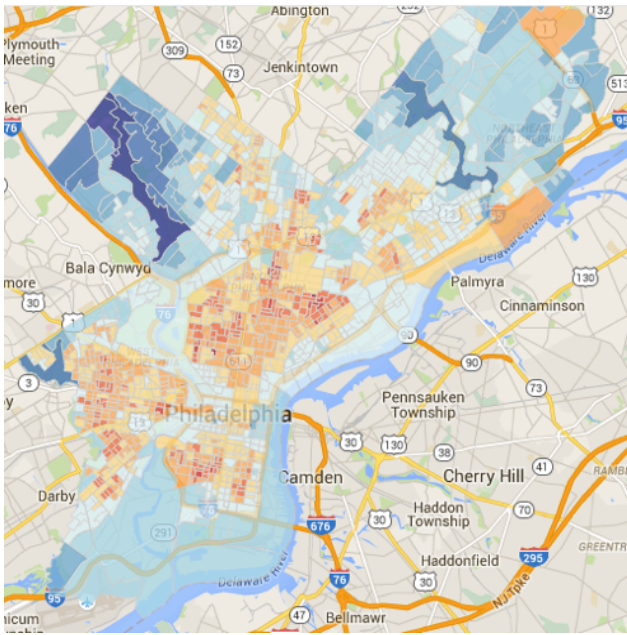
The benefits go well beyond stormwater pollution reduction. Ledesma explains, “We’re helping to create a city that’s more livable and enjoyable. Vacant lots and dilapidated playgrounds are being transformed — I can see that there’s an improvement in mental health in the neighborhoods where the work has been done. People are excited and proud. There’s more vigilance. The residents don’t want drug dealers there — they want to enjoy it.”

GETTING A LITTLE “ZEN”

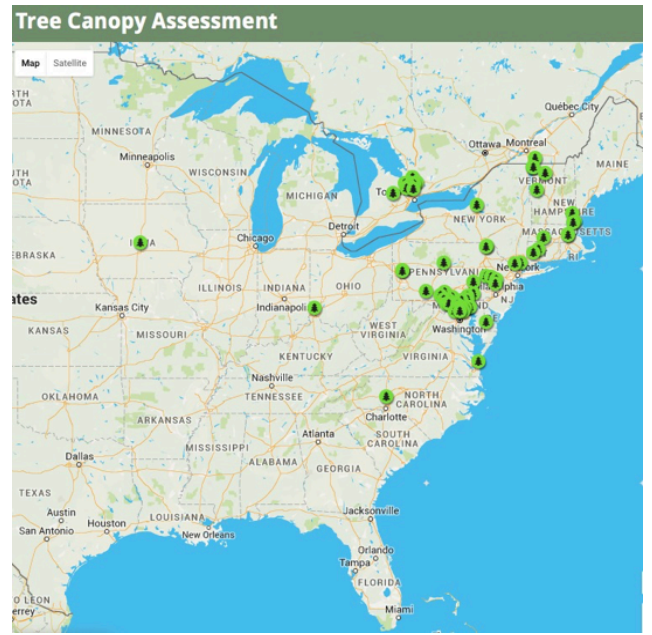
At the end of the day, the research conducted by Grove, Kondo and their colleagues is not simply about trees, nor is it simply about crime. Instead, Grove says, “It’s about improving people’s lives and giving them a choice” about how they want to live and what they do with their lives. “In east Baltimore,” Grove says, “if you tell someone ‘Go west, young man,’ they may think you mean west Baltimore. One of the kids I worked years ago recently contacted me. He said he wanted to thank me for showing him that there were places in the world other than his neighborhood.” With this kind of reaction to his work, it sometimes makes him wonder: “Do we plant trees to organize people or do we organize people to plant trees? It’s going to sound a little zen when I say this, but the best answer is ‘yes.’”

KEY FINDINGS

- In researching the connection between nature and life in underserved city neighborhoods, the U.S. Forest Service has found that crime levels tend to drop following landscape improvements.
- One of the landscape improvements that has shown a connection to lower crime levels in underserved neighborhoods is an increase in tree canopy.
- Baltimore, Philadelphia, Chicago and New York are among the cities where urban planners and nonprofit organizations are working to improve neighborhood living conditions by reducing pollution, increasing public green space and making better use of stormwater runoff.
- Cities may experience neighborhood-level social benefits such as crime reduction and an improved sense of community as a result of landscape improvements.



The i-Tree software tool can help urban land managers create 'priority planting' maps based on factors such as available planting space, demographics, and poverty levels. (Image source: Jason Henning)



More than 80 urban tree canopy assessments have been conducted by the U.S. Forest Service's assessment teams and the University of Vermont Spatial Analysis Laboratory. (Image source: University of Vermont Spatial Analysis Laboratory)

NEXT STEPS FOR URBAN PLANNERS

U.S. Forest Service research scientists are often asked for suggestions on applying their research on landscape changes and social improvements. According to Kathleen Wolf, a research social scientist at the University of Washington, "When this research is presented to law enforcement and urban land managers, the first thing I hear is 'How much will this cost?'. The second is 'How do we apply all this research to our community?' The answer has typically been to try different things and see what works. But with the volume of research that's now available, it's now possible to see what has worked in other communities and also to estimate the costs. The third thing I hear, and it's really frustrating, is 'Oh, that's Baltimore; this is Spokane. I don't think those results would happen here.' That's really frustrating, because the research has shown that you can apply the research in different locations."

This is where the University of Washington's "Green Cities: Good Health" website comes in. It's a research portal featuring almost 4,000 peer-reviewed articles on the benefits of nature in cities and towns. According to Wolf, "Now that we're in the era of Big Data, we're seeing an acceleration of crime-related research in a wide variety of disciplines and fields and also incorporating data on things like disparities of green in urban communities."

For urban land managers who are considering this concept for the first time, Austin Troy at the University of Colorado Denver offers the following advice: "Trees are an obvious first step. Having a tree inventory is important, to see where you have gaps. You can also get positive changes in crime levels from stormwater improvements that have an aesthetic benefit. Talk to police departments and look at the crime data to see where crime is happening on the street. Getting public works departments, city foresters, and landscape architects involved is a good idea too."

Community decision-makers looking to assess their urban forest resources have used the University of Vermont's Spatial Analysis Laboratory as well as iTree, which is a free software suite created by the U.S. Forest Service that provides urban and rural forestry analysis and benefits assessment tools. The USDA Forest Service's Urban Tree Canopy Assessment project helps decision-makers understand their urban forest resources.

More information on these resources can be found at www.nrs.fs.fed.us.





Philadelphia's TreePhilly initiative offers free yard trees as part of an effort to achieve at least 30% tree canopy coverage in every city neighborhood. (Image source: TreePhilly, a program of Philadelphia Parks & Recreation)

MANAGEMENT IMPLICATIONS

- Despite a common perception that vegetation helps to conceal criminal activity, recent studies have shown that landscape improvements including increased tree canopy have helped improve a sense of community and reduce crime levels.
- Recent developments in mapping and data analytics can be used to better understand the connection between nature and society.
- City departments and nonprofit organizations are leveraging this knowledge to target neighborhoods where resources can be used most effectively while realizing other improvements such as compliance with federal requirements such as the Clean Water Act.

FURTHER READING

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To provide scientific information to people who make and influence decisions about urban natural resources stewardship. The NRS Current Urban Field Station Topics is published regularly and collaboratively by the Urban Forests, Human Health, and Environmental Quality research work unit and the Communication and Science Delivery staff at the Northern Research Station.

About Us:

Forest Service Scientists work at the forefront of science to improve the health and use of our nation's natural resources, as well as our nation's forest and grasslands. More information about the Northern Research Station can be found here: <http://nrs.fs.fed.us/>

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SCIENTIST PROFILES



Morgan Grove is a research forester with the USDA-Forest Service's Northern Research Station at the Baltimore Urban Field Station and the lead social scientist for the Baltimore Ecosystem Study, a long-term ecological research project funded by the National Science Foundation. He was the first social scientist from the Forest Service to receive the President's Early Career Award for Scientists and Engineers. Morgan has several degrees from Yale University: a doctorate in social ecology, a master's degree in community forestry, and bachelor's degrees in urban planning and environmental studies.



Michelle Kondo is a research social scientist with the U.S. Forest Service's Northern Research Station at the Philadelphia Urban Field Station. Her research interests include environmental strategies for violence, injury, and disease prevention; environmental health and environmental justice; and geospatial and community-based research methods. She is also an Associate Fellow at the University of Pennsylvania's Center for Public Health Initiatives. Michelle has a doctorate in urban design and planning and a master's degree in urban planning from the University of Washington and a bachelor's degree in civil and environmental engineering from Carnegie Mellon University.



Austin Troy is a professor at the University of Colorado Denver, where he is the chair of the Department of Planning and Design. Prior to his work at CU Denver, he was a professor at the University of Vermont's Rubenstein School of Environment and Natural Resources and director of the University's Spatial Analysis Laboratory. His research interests include land use policy, environmental planning, spatial analysis, remote sensing, and land use change modeling and simulation. Austin received a doctorate in environmental science, policy, and management from the University of California, Berkeley. He also holds two degrees from Yale University: a master's degree in forestry and a bachelor's degree in anthropology.



Jarlath O'Neil-Dunne is a faculty member at the University of Vermont, where he also serves as director of the University's Spatial Analysis Laboratory. He also holds a joint position with the U.S. Forest Service. His research focuses on the application of geospatial technology to a broad range of natural resource related issues such as urban tree canopy assessment, environmental justice, wildlife habitat mapping, high-elevation forest decline, land cover change detection, community health, and water quality modeling. Jarlath has certificates in hyperspectral image exploitation and joint GIS operations from the National Geospatial Intelligence College, a master's degree in water resources from the University of Vermont, and a bachelor's degree in forestry from the University of New Hampshire.

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