

Northern Research Station

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Urban FIA: Providing Critical Insight About Our Nation's Urban Forests



Forest managers in Texas are taking a fresh look at tree resources in several cities, including Austin. Photo by Texas A&M Forest Service, used with permission.

SUMMARY

- As the United States' continuous forest census, the Forest Service's Forest Inventory and Analysis (FIA) program has provided the information needed to assess U.S. forests for more than 80 years.
- While past FIA efforts have focused on the nation's rural forest resources, the Forest Service has expanded the FIA program to include Urban FIA, which extends the FIA methodology to include urban areas.
- Through the Urban FIA program, the Forest Service partners with state and city foresters and other stakeholders to continually collect and analyze urban tree data, landowner perspectives, and information about wood flow.
- Urban FIA specialists plan to continue program implementation beyond the 35 currently active cities to eventually include about 100 of the nation's most populous cities while ensuring that each state is represented by at least one city.

The Best Time To Plant a Tree

Many people are familiar with the old saying, "The best time to plant a tree is 20 years ago. The second best time is now." The USDA Forest Service's Forest Inventory and Analysis (FIA) program team feels the same way about U.S. cities utilizing newly available data provided by the Urban FIA program: The sooner cities get involved with program implementation, the sooner they'll have their own data sets to assist in answering questions related to the quality, health, composition, and benefits of their urban trees and forests.

According to Mark Majewsky, the Urban FIA coordinator, "FIA's objective is long-term monitoring of the nation's forest lands and how they are changing over time. FIA monitors forest health and species composition, including individual tree size and crown condition, while tracking trends in tree growth, removals, mortality, and regeneration, as well as changes in land use."

Forest lands, mostly in rural areas, have been FIA's focus for more than 80-some years, Majewsky explains, adding, "With the 2014 U.S. Farm Bill, it was recognized that we needed to move beyond what most folks consider traditional forest land and start capturing the trees that make up

our nation's urban forests." Urban FIA's goal is to provide urban foresters and city planners with strategic-level, actionable data to assist them in managing U.S. urban tree resources.

Urban FIA also complements and adds to a suite of approaches that the USDA Forest Service has developed to better understand our urban forest resources. Included in this suite are:

- **Urban Tree Canopy (UTC)**
Assessments performed through high-resolution landcover imagery combined with LiDAR, which provide a complete map of where tree canopy exists in a city (including

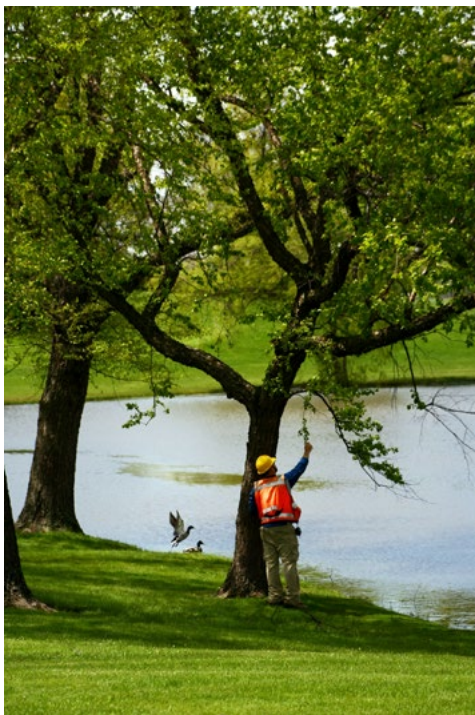
parcel-level data and ownership), and can be repeated over time to reveal gains and losses. This method can also be enhanced using historical aerial photographs to improve our understanding of context, and provide the starting point for a qualitative analysis of drivers of change.

- i-Tree, which can be used to provide a coarse model of tree cover, but is perhaps best known as a tool to model ecosystem services derived from trees.

Urban FIA incorporates i-Tree to yield data to provide systematic monitoring to understand the biophysical aspects and ecosystem service benefits of the nation's urban forests. Together, all of these tools provide powerful and complementary strategic and tactical data to understand changes within and across cities.

Old Dog, New Tricks

FIA works with state and local forestry agencies, universities, and nongovernment organizations to take a sample of U.S. public and private forest resources. It's the only comprehensive, nationwide, field-



Four Wisconsin cities hope to use Urban FIA plot data to guide urban forest management. Photo by Sjana Schanning, USDA Forest Service.

based inventory of its kind, and it helps land managers predict what their forest resources will look like 10 to 50 years into the future.

Majewsky explains that past FIA efforts used a definition of “forest land” that left out most urban areas. Specifically, FIA defines forest land as forested areas that are undeveloped, at least an acre in size and at least 120 feet wide, and that have a canopy cover of at least 10 percent. To remedy this issue, the 2014 U.S. Farm Bill, officially known as the Agricultural Act of 2014, instructed the FIA program to expand beyond FIA-defined forest land to include all trees and vegetation located in census-defined urban areas. As part of this effort, the FIA program monitors the status and trends of trees and forests in these areas while providing assessments of their ecosystem services, values, health, and risk from pests and diseases.

Just as FIA has done in rural areas, Urban FIA takes a three-pronged approach in cities that have committed to supporting the effort:

- Collecting data such as land use, tree species, land coverage percentages, and urban damage agents from one-sixth-acre plots
- Surveying private landowners to determine their views and perspectives in relation to their forests and green spaces
- Analyzing how wood is being used

A Partnership Approach

To make sure the data are locally relevant and easily understood, Urban FIA also works closely with partners and stakeholders such as city and state forestry agencies. One such partner is Texas A&M Forest Service, which helps Texas property owners maintain land and natural resources to ensure that forest lands remain productive and healthy.

Gretchen Riley, who works as partnership coordinator and staff forester for Texas A&M Forest Service, has high hopes for Urban FIA data in Texas. She explains,



A silviculture specialist gathers data for Urban FIA in Wisconsin. Photo by Sjana Schanning, USDA Forest Service.

“Texas had a significant drought in 2011. Using FIA data we were able to come up with a rough estimate of trees lost in rural areas. We couldn't do that with urban areas and had to spend money to get a rough guess. In light of the catastrophic storms and flooding events like in Houston that no one ever imagined could occur, there's a wide range of questions that Urban FIA will be able to answer.” Those questions include:

- Are certain species affected by flooding more than others?
- Does a catastrophic storm widen existing economic equity gaps?
- Do invasive species reestablish at a higher rate after flooding?

But cities won't need to wait for a catastrophic event to make use of the data. Riley says, “Our urban forests are shrinking and their services are diminishing, but a lot of our cities in Texas haven't gone out and looked at inventory on their own. They don't know the structure and function of their trees. We have so many ecoregions across the State; there's been no way to look at them locally until now.”





The city of Austin, Texas, is using Urban FIA data to prepare for emerald ash borer. Photo by Texas A&M Forest Service, used with permission.

evaluate emerald ash borer impacts. And by combining traditional FIA protocols with i-Tree and My City's Trees, the Urban FIA program can produce reports that summarize urban ecosystem service values. Reports for Houston and Austin have already been published.

Private Landowners: The Social Component

The second component of the Urban FIA program is the Urban National Landowner Survey. It's an approach that often requires a shift in thinking. According to Brett Butler, a research forester with the Northern Research Station, "There's a misconception that most urban trees are street trees and in parks. Actually, most urban trees are privately owned, in front or back yards."

After being piloted in Texas and Wisconsin, the Urban National Landowner Survey is currently being implemented in its first city, Baltimore, where responses are being gathered from randomly selected residential property owners. Butler explains, "We ask urban landowners questions such as whether they live there, if they have a garden, their attitudes toward their trees, and where they get their information about trees. This information should help stakeholders to understand the link between society and urban natural resource management. It should also help make communication with landowners more effective."

If all goes as planned, the surveys will be repeated periodically—usually once every five to 10 years. According to Nancy Sonti, an ecologist with the Northern Research Station in Baltimore, "This should help show changes in attitudes toward trees, urban wood products, and familiarity with local environmental resources and programs." The survey results will be available to anyone with an Internet connection, helping urban and community forestry professionals and organizations to customize and improve their outreach and community tree-planting efforts.

Madison, Wisconsin is another place where city officials hope to use the Urban National Landowner Survey to better connect with urban landowners. According to Katy Thostenson, a social science analyst with the Wisconsin Department of Natural Resources, "With emerald ash borer creeping across Wisconsin, we want to increase the diversity and resilience of our urban forest, as well as expand the canopy and keep trees healthy."

To accomplish this, the Wisconsin Department of Natural Resources worked with Urban FIA to conduct an urban landowner survey, then analyzed the data and developed social media campaigns. Thostenson explains, "We're building a knowledge base of how to better engage homeowners about tree care on their properties. It's a cost-effective way to reach a lot of people and to promote tree care improvements."

MANAGEMENT IMPLICATIONS

- More than 80% of the U.S. population lives in urban areas, yet the extent and value of urban tree resources are often poorly understood.
- Increasingly common environmental disruptions such as hurricanes, droughts, and invasive species are raising the urgency of urban forest management decisions.
- Through a combination of field plot monitoring, landowner surveys, wood flow analysis, and tools such as My City's Trees and i-Tree, the Forest Service's Urban FIA program is working with state and local stakeholders to provide data and intelligence to improve management of U.S. urban trees and forests.
- Through these efforts, the Forest Service seeks to help improve urban forest and wood resources management, improve sustainability, create jobs, and restore neighborhoods and watersheds.

FURTHER READING

- Lister, T.; Majewsky, M.; Hatfield, M.A.; Rowe, A.; Dunning, B.; Edgar, C.; Brandeis, T. 2015. **The urban FIA inventory: plot design, data collection, data flow and processing.** www.fs.usda.gov/treearch/pubs/50411.
- Edgar, C.B.; Carraway, B.C. 2015. **Austin's urban FIA: Seamless rural-to-urban resource monitoring in Texas.** Forest Inventory and Analysis Symposium. Portland, Oregon, December 8-10, 2015. www.nrs.fs.fed.us/pubs/50424.
- Nowak, D.J.; Bodine, A.R.; Hoehn, R.E.; Edgar, C.B.; Riley, G.; Hartel, D.R.; Dooley, K.J.; Stanton, S.M.; Hatfield, M.A.; Brandeis, T.J.; Lister, T.W. 2017. **Houston's Urban Forest, 2015.** Resour. Bull. SRS-211. Asheville, North Carolina: U.S. Department of Agriculture, Forest Service, Southern Research Station. www.srs.fs.usda.gov/pubs/rb/rb_srs211.pdf.
- More information on Urban FIA can be found at www.nrs.fs.fed.us/fia/urban.



Analyzing Wood Flow

The third part of the Urban FIA effort is wood flow analysis, which helps with optimizing the economic impact of urban wood. One of the cities that has taken the lead in this effort is Baltimore. By understanding the economics of wood flow, Baltimore and the Forest Service's Northern Research Station have been able to support programs such as the Baltimore Wood Project, a collaborative effort to improve sustainability, create jobs, and restore neighborhoods and watersheds. It's a cooperative effort that includes federal and state forestry agencies as well as private contractors.

According to Michael Galvin, who leads wood flow development for Urban FIA, "In traditional forestry you have mills that you can survey. In urban forestry the wood flow is much more decentralized. It can get pretty complicated. Part of our work is to identify and understand these networks so we can identify opportunities to make the urban wood economy work while supporting other efforts," such as a Baltimore wood waste utilization program called the Camp Small Zero Waste Initiative.

Another initiative salvages valuable wood from abandoned Baltimore rowhomes, an effort that relies on the Forest Service's efforts to connect municipal managers with researchers, wood experts, social entrepreneurs, and regional supply chains. Galvin explains, "The deconstruction aspect of wood flow typically doesn't include any input from the forestry community." To address this shortcoming, the Northern Research Station and the Forest Products Laboratory can look at the entirety of the urban wood resource, analyze the potential market value, and then help develop the supporting structures to build a networked urban wood economy.



Urban FIA data may help answer tree management questions raised after Hurricane Harvey in southeastern Texas. Photo by Texas A&M Forest Service, used with permission.

A New Perspective on Urban Trees

Urban FIA coordinator Mark Majewsky points out that urban trees and natural spaces are critical to human health and well-being, and that a neighborhood's trees can reduce air and water pollution, cut heating and cooling costs, provide shade, shelter and wildlife habitat, and contribute to social health. In addition, he points out, more than 80% of U.S. residents live in urban areas.

This creates an opportunity for Urban FIA to provide valuable insights. According

to Majewsky, "Many cities are struggling to keep their tree resource healthy and in some cases they're having trouble justifying the expense to the folks that control their budgets. You can't manage a resource unless you know what you have in the first place. The Urban FIA program provides nationally consistent, strategic-level data of a known quality that quantifies and monetizes the benefits of urban forests and how they change over time. Such data can be used by city planners and city forestry departments to better understand and communicate how important urban forests are to their communities' health and well-being."

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WEBINARS

Community of Practice FIA Landowner Survey - 2018
<https://usfs.adobeconnect.com/por0w0mtuz3d>

New Developments in Urban FIA - 2018
www.fs.fed.us/research/urban-webinars/new-developments-urban-fia

Urban FIA in Austin Texas - 2016
<https://soundcloud.com/treesarekey/urban-fia-is-key>

Urban FIA: Bringing the Nation's Forest Census to Urban Areas - 2015
www.fs.fed.us/research/urban-webinars/urban-fia

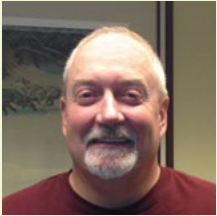




WRITER'S PROFILE

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FOREST SERVICE PROFILES



MARK MAJEWSKY is a supervisory forester with the Forest Inventory and Analysis program and is based in Minnesota. He serves as the lead for the Urban FIA program nationally and coordinates local efforts in Michigan, Minnesota, and North Dakota.



NANCY SONTI is an ecologist with the Northern Research Station. She currently works at the Baltimore Field Station as an interdisciplinary researcher studying urban social-ecological systems. Nancy's current research interests include evaluating and monitoring the health of urban forests by examining urban tree ecophysiology and processes of forest restoration and regeneration. She is also involved in research examining the motivations for engagement with urban green spaces such as community gardens and forest patches. She has a masters in conservation biology from Columbia University and a Ph.D. in plant sciences from the University of Maryland, College Park.



BRETT BUTLER is a research forester with the Northern Research Station. His current research focuses on survey methods for collecting information from private forestland owners, analyzing trends in private forest-land owners and the land that they own, and studying the factors that influence decisions made by private landowners. He received a B.S. in natural resource management and engineering from the University of Connecticut and a Ph.D. in forest science from Oregon State University.



DAVE NOWAK is a senior scientist and the i-Tree team leader with the Forest Inventory and Analysis program. His research interests focus on urban forest structure, health and change, and its effects on human health and environmental quality. This research is integrated with in the i-Tree modeling suite that quantifies the benefits and values from forests globally. Dave received his Ph.D. from the University of California Berkeley.

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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 Communities and Landscapes of the Urban Northeast research work unit and the Communication and Science Delivery staff at the Northern Research Station. <https://www.nrs.fs.fed.us/ufs/>

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