TechTransfer highlights

Monthly update from Urban Forestry

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This Month's Feature Article
Northeast Research Station
Syracuse, NY

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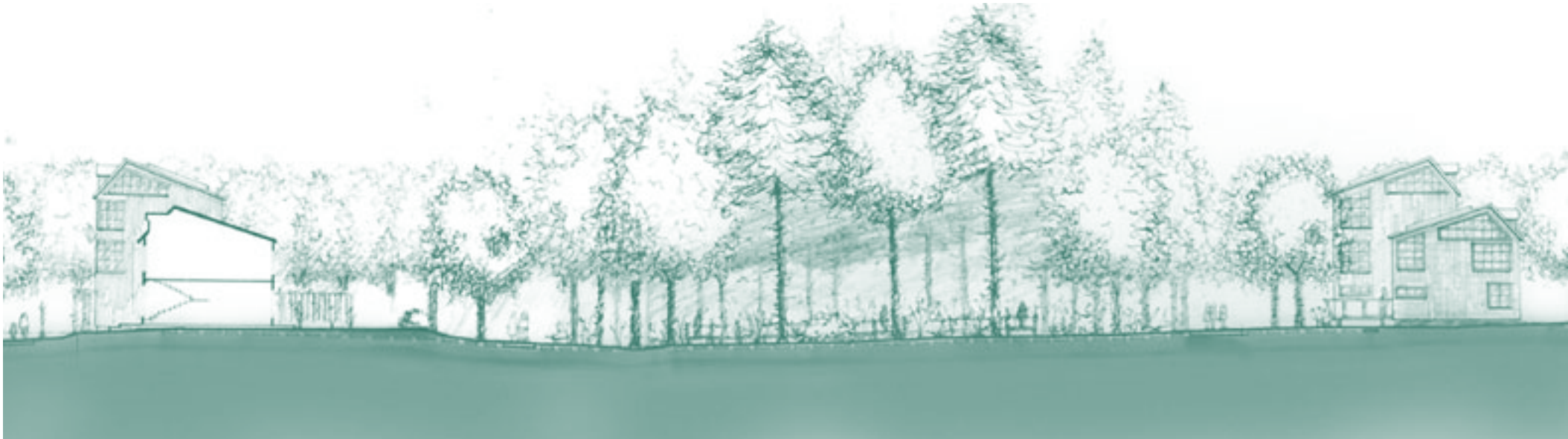

Technology Transfer Feature Article

This Month's Feature:

Northeast Research Station

Syracuse, NY

Research on:
The Effects of Urban Forests and their Management on Human Health and Environmental Quality

Urban vegetation and its management can significantly influence human health and environmental quality in and around cities. However, relatively little is known regarding these influences and what vegetation designs and management practices will optimize the net benefits to society from urban vegetation. Researchers at the USDA Forest Service Lab in Syracuse, NY, have been working over the last 25 years to:

- *Quantify the environmental effects of urban vegetation and its management*
- *Quantify the effects of urbanization on forest ecosystem pattern and processes*
- *Develop appropriate and easy-to-use vegetation management strategies and tools to improve human health and environmental quality in urban and urbanizing areas.*

Research Topics, Questions, and Findings:

Forest Service scientists from Syracuse work with numerous researchers from across the world to better understand:

Urban Forest Health & Structure -What are the structure, composition, and health of the urban forest resource across the United States, how is it changing, and what are the environmental effects of these changes?

There are an estimated 3.8 billion urban trees in the United States with a structural value of about $2.4 trillion. Researchers are developing and testing field sampling and remote sensing techniques to monitor urban forest structure and health at the national to local scale. Easy-to-use field collection and analysis tools are being developed to allow local users a means to analyze their own urban forest.

Air Quality and Greenhouse Gasses -
What effect does urban vegetation have on local and regional air quality and atmospheric carbon dioxide, and what species composition and design will maximize air quality improvement and minimize concentrations of greenhouse gases?

Modeling of increased tree cover in the New York City area revealed that increased tree cover could have a significant impact on reducing ozone levels. Scientists are working with the U.S. EPA and others to develop a means to allow urban trees and tree management to receive credit within the Clean Air Act.

Urban Climate -
What effects do urban trees have on local air temperature, relative humidity, and wind speeds, and how can urban vegetation be configured to increase human comfort and reduce thermal stress?

A new computer model (OUTCOMES – Outdoor Thermal Comfort Expert System) has been developed to quantify the effects of urban forests on human comfort.

Ultraviolet Radiation -
As vegetation can significantly reduce ultraviolet (UV) radiation loads reaching the ground, what vegetation designs will most effectively protect people from UV radiation, thereby reducing the potential for skin cancer and other problems related to UV radiation exposure?

Scientists have discovered that blocking total sky view with urban vegetation is better for protecting humans from UV radiation than just blocking the direct visible beam (tree shade) as a significant amount of UV can come from scattered radiation from the sky.

Energy Conservation - What impacts do trees have on building energy use, and how can they be optimally configured to reduce building energy use and consequent pollutant emissions from power plants?

Data from Philadelphia reveal existing tree cover

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saves city residents approximately $1.9 million annually and avoids the emissions of about 1,500 metric tons of carbon per year.

Forest Growth and nutrient Cycling -
How does urbanization and exotic species composition affect forest growth and nutrient cycling in and around urban areas?

Data from New York City and Baltimore reveal that invasion by exotic earthworms and high rates of N deposition can greatly increase the loss of N (an important surface water pollutant) from forest soils.

Urban Soils - How are soils modified by urbanization and what effect do these modifications have on plant growth and health?

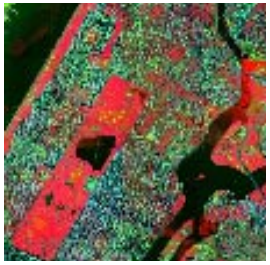
Soils in urban areas vary considerably in character (i.e., there is no typical urban soil) with some urban effects (soil compaction and heavy metal contamination) reducing plant productivity while others (fertilization and irrigation) can result in increased productivity.

Water Quality and Quantity - What effects do urban trees have on local water quality and flooding; what urban forest configurations are best to improve water quality and reduce flooding?

A new GIS-based computer model is being developed to integrate with existing air pollution and urban forest structure models to quantify the impact of urban forests on stream flows, flooding, and water quality.

In addition to quantifying urban forest effects and developing management guidelines to improve human health and environmental quality in urban areas, various computer tools and applications are being developed to aid local users in analyzing the benefits of their urban forest:

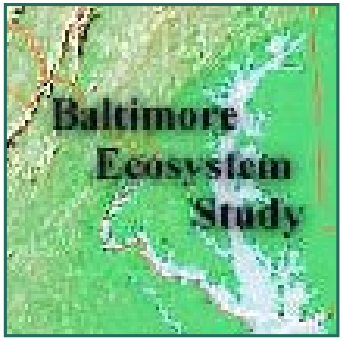
Remote Sensing Applications - New remote sensing technologies and data are being used to develop high-resolution maps of vegetation and artificial surfaces in urban areas. At the national scale, this research unit is cooperating with numerous agencies to develop cover maps for the entire United States using satellite data



(30-meter resolution). These maps will be available for download for integration into GIS systems to aid in local urban forest management.

Spatial Computers Tools - In addition to developing computer programs (e.g., the Urban Forest Effects [UFORE] model) to aid cities and citizens in determining the structure, health, and functions of their urban forests, new tools are being developed to aid in mapping the existing forest effects, determining the best species and locations for trees to improve the environment, quantifying urban tree effects on water flows and water quality, and projecting future effects and growth of the urban forest based on differing management scenarios. Tools and field manuals are also being developed to facilitate easy data collection and analyses by local users.

The UFORE model, which quantifies urban forest structure, functions, and values, is currently being developed into a user-friendly Windows-based format to aid in local urban forest management. Data collection and analysis of urban forests has or currently is occurring in: Atlanta, GA; Baltimore, MD; Baton Rouge, LA; Boston, MA; Brooklyn, NY; Calgary, Alberta; Fuenlabrada, Spain; Hefei, China; Houston, TX; Jersey City, NJ; Freehold, NJ; Moorestown, NJ; Morgantown, WV; New York, NY; Ningbo, China; Philadelphia, PA; Phoenix, AZ; Porto Alegre, Brazil; San Juan, PR; Santiago, Chile; Syracuse, NY; Toronto, Ontario, and Woodbridge, NJ.



Baltimore Ecosystem Study
Scientists are principal investigators on one of the first National Science Foundation funded urban long-term ecosystem research projects. On this project in Baltimore, a team of researchers investigate the long-term effects of urban vegetation on city ecosystem processes. Much of the scientist's research is conducted as part of the Baltimore Ecosystem Study.

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