Urban and Community Forest Technology Transfer

National Strategy for 2002-2005

United States Department of Agriculture

Forest Service

FS-722
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Dear Reader:

From the Deputy Chief of State and Private Forestry (S&PF)

It gives me great pleasure to present this Urban and Community Forestry Technology Transfer National Strategy, which will guide the technology transfer portfolio of our Urban and Community Forestry Program from 2002 to 2005. The strategy was developed collectively with technology transfer specialists, research and development scientists, and selected partners. This strategy links directly to our Action Plan for Urban and Community Forest Resources. The action plan links to the agency's mission by ensuring the long-term care, health, and sustainability of urban and community natural resources.

As we continue implementing our plan for the Federal role in technology transfer, we work across USDA Forest Service mission areas. We work together to improve technology transfer by developing better tools and products that are research-based and scientifically proven to protect, restore, and enhance forest, watershed, and urban ecosystems.

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Executive Summary

Urban and community forestry is no longer just basic street tree planting. It is an essential and highly valued component of numerous large-scale, long-term environmental and community sustainability projects. Urban and community forests improve environmental quality, enhance individual and community well-being, provide a range of services to communities, and produce a healthier environment for the majority of the U.S. population.

Our knowledge of the significance of urban and community forests is expanding rapidly as research continues to demonstrate the important role that these forests play in improving the quality of urban life. By sharing more effective information and state-of-the-art technologies, urban and community forestry technology transfer provides a mechanism for continuous improvement of our urban ecosystems.

Urban and community forestry technology transfer is the development and dissemination of related research and technical information, products, outputs, concepts, and guidelines to organizations and individuals that will be able to use the technology. Technology should be developed and disseminated in a form that helps them address their particular situation.

Our mission is to—

- Facilitate responses to scientific findings about the condition of urban ecosystems, including watersheds and wildlife habitat.
- Improve the management of these ecosystems.
- Encourage the wise use of innovative, cutting-edge technology and information resource management.

This document outlines the current status of technology transfer and presents a 4-year strategy for improving the delivery of new urban forestry research findings and innovative tools. This strategy links directly to the Action Plan for the Urban and Community Forest Resource Strategy under Strategy Component 4 (Advance Research and Technology Transfer).

Introduction

Urban and community forests represent far more than tree canopy in cities and communities. Predominately characterized by the presence of trees, these forests contain other vegetation such as grasses, annuals, perennials, and shrubs. Urban and community forests are also composed of concrete, buildings, roadways, urban infrastructure, soils and water, people, and wildlife. Urban and community forests can moderate climate, reduce energy use, lessen atmospheric carbon dioxide, and enhance water and air quality.

Urban and community forestry plays an important role in improving the quality of life for city and community residents. The quality of the cities' and communities' environment also influences residents' decisions to experience other natural environments. The nature of the environment plays an important role in people's interest in, and use of, forests, as well as their participation in natural resource management activities.

By maintaining and restoring the health of trees, forests, and other greenspaces, the U.S. Department of Agriculture (USDA) Forest Service Urban and Community Forestry (U&CF) Program encourages the creation of healthier, more livable environments in cities and communities throughout the country. U&CF Program activities are based on more than a decade of research establishing that urban and community forests are complex ecosystems with intricate links among their physical, biological, and social components.

Technology transfer ensures that the U&CF Program's growing knowledge of urban and community forestry's role is understood and that important principles are used by practitioners, community leaders, local residents, and other end-users. Technology transfer provides a mechanism to further enhance the viability of our urban ecosystems through more effective delivery of information and state-of-the-art technologies.

This document outlines the current status of technology transfer and presents a 4-year strategy for dramatically improving the delivery of new urban forest research findings and innovative tools. This document links directly to the Action Plan for the Urban Forest Resources Strategy. The purpose of the Action Plan for the Urban Forest Resources Strategy is to encourage the USDA Forest Service to work in a strategic direction with common goals to ensure more livable communities.

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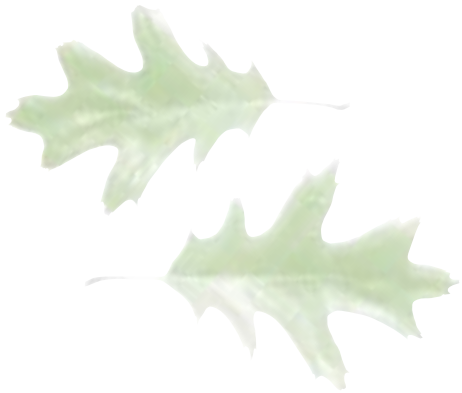

What Is Technology Transfer?

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VISION

Urban and community forestry research and technology transfer provide useful information that influences urban natural resources policy and management at the national, regional, and local levels.

MISSION

Our mission is to—

- Facilitate responses to scientific findings about the condition of urban ecosystems, including watersheds and wildlife habitat.
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AUTHORITY

The primary authority for urban and community forestry technology transfer is Section 9, Urban and Community Forestry Assistance, of the Cooperative Forestry Assistance Act of 1978 (Public Law 95-313) as amended by Public Law 101-624. Section 9 authorizes the Secretary of Agriculture to provide financial, technical, and related assistance to State foresters or equivalent State officials. In providing such assistance, the Secretary is authorized to cooperate with interested members of the public and nonprofit organizations. The Secretary is also authorized to cooperate directly with local government units and others in implementing this section whenever the Secretary and the affected State forester or equivalent State official agree that direct cooperation would better achieve the purposes of this section. Technical, financial, and related assistance must focus on the protection, restoration, and management of trees, forests, and related resources in cities and communities.

THE FEDERAL ROLE

The Federal role in technology transfer through the U&CF Program includes providing information, education, technical assistance, and technology to policymakers and the public to help protect, restore, and improve the health of urban ecosystems in the face of urban sprawl and development. The role also

includes providing new technologies to restore much-needed greenspace in declining areas of older, more mature cities. Activities focus on improving the role and contribution of urban forests in retaining and protecting watersheds, maintaining and improving air and water quality, and improving the livability and associated human and economic health of communities.

The specific attributes of the Federal role in State and Private Forestry (S&PF) are to:

- Provide leading-edge technical assistance.
- Help build strong State forestry programs.
- Strengthen the economic health of communities.
- Provide targeted financial assistance.
- Reduce Federal investments through prevention.
- Monitor and assess sustainability trends.
- Serve as an information clearinghouse.

TECHNOLOGY TRANSFER STRATEGIC DIRECTIONS

The urban and community forestry technology transfer strategy is designed to improve information and overall service to forestry professionals, practitioners, end-users, and the public and to ensure the stewardship of natural resources where people live, work, and play. This includes special emphasis on increasing State capacity, expanding partnerships, reducing sprawl, and strengthening applied research and technology transfer beyond the current level.

National Technology Transfer Team

A national technology transfer team has been established to strategically integrate activities promoting research and technology transfer that addresses regional urban and community forestry issues and to provide practical results at the local level. The team provides a shared vision, focuses resources across regions, and identifies needs and key opportunities.

Key Technology Transfer Issues

The following are priority forestry issues and focus areas identified by the technology team:

- Fire-Urban Wildland Interface
- Exotic/Invasive Species
- Urban Sprawl
- Environmental Justice
- Urban Forest Health
- Water Quality
- Forest Health Monitoring
- Green Infrastructure
- Livability
- Sustainability

What Are Our Technology Transfer Goals and Objectives?

GOALS

GOAL 1:

To improve the process of technology transfer by developing better tools, models, and products that are research-based and scientifically proven to protect, restore, and enhance tree management, watersheds, and urban ecosystems.

GOAL 2:

To ensure that urban and community forestry efforts are technically sound and sustainable, and meet the needs of practitioners and end-users.

OBJECTIVES

OBJECTIVE 1. Identify audiences and information needs

Conduct analysis to identify requirements, needs, and expectations of targeted audiences to effectively transfer meaningful and technically sound information.

Action items include:

- For specific issues, identify key audiences that influence urban and community forestry policy and management.
- Identify key groups that influence urban and community forestry policy at the national, regional, and local level.
- Develop appropriate strategies to help selected partners reach their goals.
- Coordinate, as needed, with the National Association of State Foresters (NASF), Urban Forestry National Committee, and State forestry agencies to meet their needs.
- Use national research and technology transfer for assessments and/or surveys.
- Survey target audience for needs and review existing surveys.
- Interpret urban and community forestry research and respond to issues of the target audience.
- Conduct a gap analysis of information needs vs. information availability.
- Gain access to grant application titles and abstracts, regardless of funding sources.

OBJECTIVE 2. Increase partnerships and collaboration

Through collaboration, increase the effectiveness of outreach and partnerships to help influence urban and community forestry policy and program implementation.

Action items include:

- Identify audiences that must be reached to implement partnership and collaboration objectives.
- Identify partners who can help reach these audiences.
- Develop appropriate strategies for working with the key partners to reach our goals.
- Work to colocate S&PF and R&D selected urban and community forestry staff members.
- Improve coordination with the urban and community forestry centers.

OBJECTIVE 3. Improve communication and coordination

Improve interactive communication and coordination among researchers, urban foresters, practitioners, the National Urban and Community Forestry Advisory Council (NUCFAC), Forest Service staffs, State forestry agencies, external partners, and other end-users.

Action items include:

- Provide monthly highlights.
- Conduct conference calls.
- Improve information through Web sites.
- Cosponsor conferences and workshops.
- Repackage material based on social research.
- Communicate more effectively among Washington Office S&PF, Research and Development (R&D), regions, States, and partnering organizations.
- Create regional technology transfer teams and/or work closely with the U&CF regional coordinators.

OBJECTIVE 4. Identify new information and resources that are available

Using the latest technology in a user-friendly format, create methods and mechanisms to obtain and transmit newly developed research-based information.

Action items include:

- Disseminate research stations' publications and other information.
- Survey research stations' annual reports and NUCFAC's, ISA's, universities', and other organizations' Web sites.
- Develop and improve existing techniques to survey current cutting-edge and ongoing research (for example, Web sites).
- Identify staff and resources needed.

- Coordinate activities with conservation education coordinators.
- Coordinate activities with the Office of Communication to make sure online and other information is made available.
- Participate in research meetings.
- Participate in Urban National Forest Coalition meetings.
- Develop a nationally coordinated Web site.

OBJECTIVE 5. Remove "barriers" and obstacles

Identify barriers and/or obstacles—from inadequate staffing to funding—that prevent effective delivery of technology transfer research and information.

Action items include:

- Conduct research to identify barriers.
- Obtain increased funding.
- Work with appropriate partners.
- Identify statutory and organizational barriers.

What Are Our Accomplishments?

Urban and community forestry technology transfer activities are implemented and delivered through work units of USDA Forest Service research stations and USDA Forest Service urban forestry technology transfer centers.

Urban and community forestry technology transfer activities are also delivered through universities, other Federal agencies, and not-for-profit organizations. Delivery of activities is implemented in full partnership with State forestry agencies.

RESEARCH STATIONS

North Central Research Station

Scientists at the North Central Research Station's work unit located in Evanston, IL—focus most of their research on urban forests and the people who use them. The researchers' mission is to provide information, concepts, and guidelines for managing forest settings based on improved understanding of urban resident's values, perceptions, and interactions.

In cooperation with researchers from universities, representatives from public agencies and private groups, and forest managers and planners, USDA Forest Service scientists are trying to discover:

- What meanings and values urban people place on forests.
- How urban residents perceive trees and forest ecosystems and their changes over time.
- How trees are used to improve the quality of urban parks, rivers, greenways, trails, and corridors.
- How urban and community forestry programs encourage citizens to actively participate in caring for trees and urban ecosystems.
- What role urban and community forestry plays in increasing community cohesion, perceived safety, economic development, and revitalization.

Northeastern Research Station

Urban vegetation and its management can significantly influence human health and environmental quality in and around cities. However, relatively little is known about which vegetation designs and management practices will optimize these net benefits. At the research station work unit in Syracuse, NY, USDA Forest Service scientists work with numerous cooperators to: (1) quantify the environmental effects of urban vegetation and its management, and (2) develop appropriate vegetation management strategies to improve human health and environmental quality in urban and urbanizing areas.

The following research topics are currently being investigated:

- *Urban forest structure*—What is 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?
- *Air quality and greenhouse gases*—What effect does urban vegetation have on local and regional air quality and atmospheric carbon dioxide? What species composition and design will maximize air quality improvement and minimize concentrations of greenhouse gases?
- *Urban vegetation maintenance emissions*—How much do various vegetation maintenance practices contribute to the emission of air pollutants and greenhouse gases?

- *The Urban Forest Effects (UFORE) Model*—How will this new model allow individual communities and cities to easily, accurately, and cost-effectively quantify their urban forest structure and its effect on air quality and atmospheric carbon dioxide?
- *Urban climate*—What effects do urban trees have on local air temperature, relative humidity, and wind speeds? How can urban vegetation be configured to increase human comfort and reduce thermal stress?
- *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?
- *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?
- *Forest productivity and nutrient cycling*—How does urbanization and exotic species composition affect forest productivity and nutrient cycling in and around urban areas?
- *Urban soil formation and classification*—What soil formations exist within cities, how are they formed, and what effect do they have on vegetation structure and health?

Pacific Southwest Research Station

Located on the campus of the University of California, Davis, the Center for Urban Forest Research serves the 17 Western States and Pacific islands. The center's primary purpose is to demonstrate new ways in which trees add value to communities. The center also creates opportunities for public investment in the future of community forests.

One unique aspect of the center is the partnership that has been established between S&PF and the Pacific Southwest Research Station. S&PF recently located a new staff position at the center to enhance the technology transfer program and direct the communications/outreach effort. The position's success is encouraging and serves as a model for colocating S&PF and R&D staff to maximize talents, expertise, and resources.

The center helps create better urban and community forests through:

- Performing research that shows that community trees have value far beyond beauty and by converting results from this research into financial terms that stimulate investments in the management and sustainability of community forests.
- Creating new methods and strategies for managing and caring for community forests to help optimize their benefits and investment value.

- Delivering state-of-the-art training programs that are based on the latest research findings.
- Providing technical assistance in the form of research expertise to help solve local problems and build community capacity.

Current research efforts include:

- *Energy conservation*—Simulating different urban and community forest configurations on building microclimates to better understand the relationship between tree location and energy used for heating and cooling residential buildings. The magnitude of potential energy savings associated with large-scale urban tree planting is being measured using a variety of meteorological instrumentation in conjunction with monitoring building energy.
- *Air quality*—Assessing the cost-effectiveness of urban and community forest air pollution control measures. Urbanization has been associated with increased concentrations of ozone and other pollutants, resulting in a multibillion-dollar problem that affects most large U.S. cities. Economic analysis is used to compare the cost-effectiveness of different urban and community forest configurations with traditional air pollution control measures.
- *Benefits and costs*—Developing and testing models to quantify total benefits and costs associated with the planting and long-term care of trees. Research with image processing technologies and geographic information systems (GIS) is being linked with analytical models to predict effects of urban forest change on the environment over space and time. Cost-Benefit Analysis to Trees (C-BAT) is a computer simulation model that simulates growth and accounts for the annual cost of newly planted trees in locations such as parks, residential yards, streets, and undeveloped land.
- *FireWise landscapes*—Developing mitigation and restoration measures to reduce environmental and economic costs of urbanization on national forests and associated lands. This research is conducted mainly in the Sierra Nevada region where population growth is predicted to increase three to five times in the next 50 years.

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Southern Research Station

In Athens, GA, the Southern Research Station's work unit conducts research to identify the benefits and values from urban forests in the South and the social and land use effects of expanding urban populations at the wildland-urban interface. Research seeks to develop an information base and

better analytical approaches that will help shape urban policy and urban forest management to be more responsive to changing demands, environmental values, demographic composition, and the needs for social equity.

Research efforts include:

- Identifying the recreational importance and primary users of urban national forests in the South, including their attitudes and preferences about the management of these forests for both recreation and nonrecreation uses.
- Identifying and characterizing human uses and values (noneconomic) of urban forests; constraints to their use across urban population strata, especially potentially underserved urban populations; and the effect of differing value sets on urban forest policy.
- Studying urban residents' knowledge, perceptions, and opinions about urban conditions, urban expansion, and urban issues related to management of urban forests.
- Studying urban residents' knowledge, perceptions, and opinions of forestry in general and identifying segments of urban publics based on their knowledge, opinions, demographics, lifestyles, and other differentiating characteristics for guiding forestry outreach and education.
- Identifying paths for more effective urban and community forestry communication, education, and involvement with urban residents through segmenting the urban populations of the South by differences in lifestyles, environmental attitudes, demographics, and social factors. Evaluating the role of public education in achieving more effective urban forest management.
- Improving indicators for monitoring the ability of urban forests and the urban/wildland interface to provide sustained social and economic benefits equitably across socioeconomic strata, especially income and ethnicity. Improving indicators of sustainable urban forest management with an emphasis on results in improving urban forest environments.
- Estimating the economic value of trees and urban natural landscapes, including urban forest stands, urban/wildland interface settings, and the study of urban property values.
- Developing tools to monitor and forecast urban expansion, economic development, demographic shifts, rural development, land use changes, and climate change in the South. Developing approaches such as hotspot mapping for showing areas where urban expansion, development, or recreation demand intensification is affecting forest resources, both urban and rural.

Urban and community forestry is no longer just basic street tree planting. It is an essential and highly valued component of numerous large-scale, long-term environmental and community sustainability projects.

- Improving methods of delivering research information to stakeholders.
- Developing approaches and models for predicting the effects of urbanization and other land use changes on the size, condition, and benefits flowing from the resulting urban forests in the South.

The Southern Research Station is in the process of developing a new research work unit and the Southern Center for Wildland Urban Interface Research and Information in Gainesville, FL.

URBAN FORESTRY TECHNOLOGY TRANSFER CENTERS

Southern Center for Urban Forestry Research and Information

The Southern Center for Urban Forestry Research and Information at Athens, GA, was created by the USDA Forest Service Southern Research Station and Southern Region to meet the expanding demand for urban and community forestry research and information in the South. The center provides a variety of services to the 13 States in the Southern United States. The primary target audience is the State forestry agencies; however, services are also provided to Cooperative Extension Service employees, researchers, municipal foresters, members of nonprofit organizations, arborists, consultants, and others.

The center has four main goals:

- Identifying research and information needs of customers.
- Communicating research results and other information with customers through publications, conferences, workshops, and other educational resources.
- Facilitating the exchange of information between researchers, practitioners, and others involved with urban forestry.
- Providing technical assistance.

Northeastern Area Urban Forestry Technology Transfer Centers

The Northeastern Area's three geographic Centers of Excellence support the technology transfer component of the Federal U&CF Program. The combined efforts of the centers serve the 20 Northeastern and Midwestern States and the District of Columbia. The overriding mission of each center is to contribute to healthy and sustainable communities and ecosystems by identifying and responding to urban and community forestry information needs, coordinating and supporting new and existing

research, and facilitating the exchange of information. Each center has a primary focus area and staff expertise: Urban Forest Health (Midwest Center); Management Tools (Northeast Center); and Public Relations and Marketing (Mid-Atlantic Center).

Midwest Center for Urban and Community Forestry

Located in St. Paul, MN, the Midwest Center for Urban and Community Forestry is a cooperative partnership between the Northeastern Area and the University of Minnesota Department of Forest Resources. The center provides service to the seven Midwestern States of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin.

The mission of the center is to:

- Facilitate the development of technology transfer programs that are science-based, support innovative technologies, and address key issues related to urban forest health.
- Transfer information, products, and services to policy-makers, resources managers, and other end-users using preferred and effective educational outreach methods.
- Promote partnerships among Federal, State, and local governments; nonprofit groups; educational institutions; land developers and planners; and the green industry to promote healthy and sustainable communities and the stewardship of urban forest resources.
- Administer funding for focused initiatives that address key urban forest health issues, needs, and research priorities with the Midwestern States.

Northeast Center for Urban and Community Forestry

Located at Amherst, MA, the northeast center provides service to the six States of New England and New York. The center responds to urban and community forestry needs and facilitates and supports new and existing research among the States in the region in order to contribute to healthy and sustainable communities.

The center:

- Provides a point of access for research, information, and technology relating to urban and rural communities.
- Fosters community participation and volunteerism in the stewardship of healthy sustainable communities.
- Supports partnerships among Federal, State, and local officials; green industry and utility professionals; and volunteer groups.
- Addresses the full-range of economic, social, and demographic diversity that exists in New England and New York. Replicates successful programs and initiatives around the New England and New York area.

Urban and community forests improve environmental quality, enhance individual and community well-being, provide a range of services to communities, and produce a healthier environment for the majority of the U.S. population.

Mid-Atlantic Center for Urban and Community Forestry

The Mid-Atlantic Center for Urban and Community Forestry, located at Keystone College in La Plume, PA, responds to the needs of Delaware, Maryland, New Jersey, Ohio, Pennsylvania, West Virginia, and the District of Columbia. The center promotes urban forest health through partnership building, effective training, technical assistance, outreach, and the facilitation on new technology applications. The center strives to address national urban and community forestry needs on a regional level.

The center's technology transfer objectives are to:

- Support the delivery of State forestry programs to ensure the ecological and natural resource needs of the urban forest are met.
- Collaborate with a broad range of partners and specialists to ensure sustainable use of the urban forest at a regional scale.
- Facilitate and communicate innovative technologies and cooperative programs related to urban and community forestry.
- Assist with congressional operations, marketing, and promotion of emerging urban and community forestry issues.

What Are Our Projected Outcomes?

The Technology Transfer Team will:

- Help make current technology accessible to practitioners and end-users.
- Use existing Web sites to deliver key information.
- Highlight success stories and accomplishments.
- Explore a national social marketing analysis.
- Develop a "How To" guide.
- Provide monthly technology transfer highlights.
- Foster better integration and coordination with researchers, urban foresters, and personnel from other Federal and State agencies, universities, and not-for-profit organizations.
- Ensure that R&D is an invested partner and participant in the S&PF U&CF program.
- Develop a strong partnership with NUCFAC.

Urban and community forestry research and technology transfer provide useful information that influences urban natural resources policy and management at the national, regional, and local levels.

Conclusion

As our knowledge of urban and community forest resources continues to expand through research, we will use state-of-the-art technologies as effective communication tools for improving our urban ecosystems. Technology transfer will enhance our growing knowledge of newly developed research and demonstrated use by community leaders, local residents, professionals, and other end-users. It will play a major role in ensuring that information is more accessible to practitioners and the public. Technology transfer will also help forestry professionals provide expert advice by providing innovative technological tools to ensure healthy trees and forests where people live and recreate. Through the U&CF Program, we will continue to lead communities in providing better stewardship of urban natural resources.

Advances in research and technology will help us improve environmental quality, enhance individual and community well-being, provide a wide range of services to individuals and communities, and produce healthier environments for the vast majority of the U.S. population. As a result, we will create healthier watersheds and sustainable forest ecosystems for more than 70 million acres of America's urban and community forest resources.

National Technology Transfer Team

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