National Research Plan for Urban Forestry: 2005-2015

A Report by the National Urban and Community Forestry Advisory Council

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Cover Photos

U.S. Forest Service, Guy Kramer, University of Washington (bottom center photo), and Lenny Librizi, (bottom right photo).

Other Photos

USDA Natural Resources Conservation Service provided photos on pages 1, 3, 4 (bottom), 6, 11 (bottom two photos), 12 (top photo) 14 (top photo).

Guy Kramer, University of Washington provided photos on pages 2, 4 (top photo), 5, and 16.

Kenneth R. Law, USDA APHIS PPQ, through *www.forestryimages.org,* provided photo on page 8, left.

David Cappaert, through *www.forestryimages.org,* provided photo on page 8, right.

U.S. Environmental Protection Agency provided photos on page 9 (top right photo).

Gil Wojciech, Polish Forest Research Institute, through *www.forestryimages.org,* provided photo on page 9, left.

William Sullivan, University of Illinois, provided photo on page 12 (bottom photo).

All other photos by the Forest Service.

Introduction

Landscapes that include trees, parks, woodlots, greenbelts, natural areas, and native forests—both naturally occurring and planted—are found in communities throughout the United States. These "urban and community forests" are unique from rural forests because of the dominant role of human activity in their creation and management. The term "urban and community forests" is used commonly by professionals who work with trees in urban areas and refers to the trees and forests found in urbanized settings—in the center of cities and towns, in suburbs and rural communities, and at the edge of wildlands.

Recent surveys of experts and scientific publications point to the urgent need for more research concerning urban forests. This report is directed to the leadership of federal agencies and national organizations that have the capacity to fund and conduct research on urban forests. The purpose is to identify and clarify research priorities in an effort to integrate urban forest science activities with other science initiatives, particularly those of the Forest Service.

A Vision for Urban Forest Research

Trees and forests are integral to sustaining a high quality of life in our cities and towns. Research, development, and effective communication of new science-based knowledge are increasingly needed to sustain both natural and human populations within built environments. Two broad programs of research and technology transfer have been identified:

1. Threats to all forests, urban or traditional, must be reduced and managed. Current rates and patterns of urbanization in the United States cause fragmentation of forest lands and eliminate forest buffers and corridors that extend from urban lands to the nation's national parks and forests. Fire, fuels, and invasive species are the shared risks of urban and wildland forests. In addition, urban trees and natural areas also face tremendous stress from land-use change and reduced growing space.

2. Our collective understanding of the benefits provided by urban forests, including environmental, social, and public health benefits, must be improved and highlighted. This should take into account the economic impact, cost/benefit ratios, and other factors that affect these forests. Trees provide considerable ecosystem and environmental services. As we examine the functions of trees and forests, their values become clearer. The Forest Service leadership in science has encouraged other federal agencies (such as the U.S. Environmental Protection Agency, the Department of Housing and Urban Development, and the Department of Energy) to acknowledge the benefits provided by urban and community forests. Only when there is a true and complete accounting will the full value of urban forest resources become apparent to all.

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Research Planning and Strategy

The National Urban and Community Forest Advisory Council was established by the 1990 amendment to the Cooperative Forestry Assistance Act of 1978. One of the congressional mandates is to develop "…a national action plan that includes recommendations for new and expanded research efforts directed toward urban and community forestry concerns; a summary of research priorities; and an estimate of funds needed to implement such research on an annual basis for the next 10 years." The Council's first urban forest research plan was produced in 1991 and has guided research and technology transfer activities for more than a decade.

In 2002, the Council initiated a review and update of the 1991 plan. Two processes—a national survey of experts and a research summit meeting—generated an extensive list of scientific needs and priorities. Findings are summarized in A Revised National Research and Technology Transfer Agenda for Urban and Community Forestry[1]. In 2004, the resulting agenda was integrated with the broader research agenda of the Forest Service to produce this report.

How large is this urban forest? The U.S. Department of Agriculture's Forest Service estimates that the metropolitan areas (urban counties) of America cover 24.5 percent of the land area of the lower 48 states. Nationally, urban areas have an average tree cover of about 27 percent compared with the national average of about 33 percent for all lands.

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[1]Makra, Edith; Watson, Gary. 2003. A revised national research and technology transfer agenda for urban and community forestry. Champaign, IL: Tree Research and Education Endowment Fund. 68 p.

Strategic Goals

Six goals will guide efforts in research, development, and technology transfer in urban and community forestry research for the next 10 years. This plan is presented as a framework of national goals which, when achieved, will provide state, regional, and local communities with the information needed to effectively manage optimal health and benefits of urban forests, now and in the future.

Goal 1 - Expand knowledge and innovation about urban forest resource management to promote urban ecosystem health and sustainability

Goal 2 - Assess and monitor changing land use, and develop policy and practices to reduce landscape change

Goal 3 - Develop and deliver knowledge to mitigate and control invasive species and natural disturbances

Goal 4 - Expand understanding of how trees and forests enhance air and water quality and other environmental services

Goal 5 - Understand and implement urban forest systems and conditions that enhance human health and well-being

Goal 6 - Assess and implement community development and economic benefits through community-based planning and management of forests

Goal 1 – Expand knowledge and innovation about urban forest resource management to promote urban ecosystem health and sustainability

How do trees add value to our cities?

The urban and community forest plays a key role in sustaining our urban ecosystems, providing value to communities by reducing energy consumption, creating livable and safer communities and providing cleaner air and water, recreational opportunities, and aesthetics. Science-based computer models (developed at Forest Service laboratories) have compared costs associated with tree care to the benefits provided by trees; the benefit/cost ratio is positive. Of special note, larger trees produce greater benefits.

What are the challenges to the urban forest resource?

There are many stresses in the urban landscape that severely affect the urban forest, thereby reducing benefits. These stresses include air pollution, compacted soils, and construction activities. Greater understanding through scientific study is needed to encourage healthier, longer-lived urban trees and forests because forest benefits greatly increase for older and larger trees.

Urban forest risk management is an important activity. Trees in cities grow in and around human settlements. Because of this close interaction between people and trees, urban and community forest resources must be actively managed to ensure public safety as well as the safety of those who manage and maintain the forest.

To effectively manage all aspects of the urban forest, urban foresters must have a basic knowledge of the forest's structure and function, improved arboricultural "tools," and appropriate models to test the efficacy of management decisions and plans.

Urban forests touch the lives of nearly every person in the United States, so maintaining the health and stability of the urban forest is vital. The building blocks of the urban forest are primarily single trees or small groups of trees managed by millions of individuals on their property. In 1998, urban forestry professionals ranked only 23 percent of their city forests as being in good health. Advanced knowledge and communication tools are needed to aid public and private forest managers.

Important Research Questions

- What is the extent and condition of the urban forest resource? Urban areas should be included in the National Forest Inventory and Assessment and the Forest Health Monitoring programs of the Forest Service. This data will help target future research and spending needs.

- What tools can be used by communities to manage their forest resources? Effective and reliable management tools need to be developed, distributed, and implemented in communities.

- How should we manage patches of native forest within urbanized areas? Better knowledge of forest dynamics and management practices is needed to support tree longevity, stability, and aesthetics.

- How can we minimize tree risk? Knowledge needs include: risk assessment, pruning, growth conditions, plant health care, root protection, improved worker safety, and better diagnostic tools for determining the structural integrity of trees.

- What are the particular stresses and diseases of urban trees? What are the effects of chronic, acute, and episodic stresses on tree health, structure, and longevity, and disease occurrence?

Goal 2 – Assess and monitor changing land use, and develop policy and practices to reduce landscape change

The Rate of Urbanization

The land area of America's national parks and forests has increased slightly in recent decades. Urbanization of our cities and towns has proceeded at a much faster pace. In 2004, about 4.4 percent of the total land area of the lower 48 states was considered urban. By 2050, more than 14 percent of our land area will be urban if current trends continue. Also, about one-third of all U.S. homes are in the landscape interface of wild and urban lands.

In 2004, Forest Service leaders identified fragmentation and urbanization as major threats to the National Forest System. In 2000, the Southern Forest Resource Assessment recognized urbanization as the greatest threat to southern forests. Similar conditions threaten urban ecosystems. Fragmentation is a major reason that species become threatened or endangered. If future urban growth is not well planned, it will become a significant threat to all natural areas.

Recently, science has begun to demonstrate the pace of natural area loss, identified where it is happening, and revealed environmental and community consequences. More effort is needed to further our understanding of the process of urbanization and landscape conversion. Land-use decisions by states, counties, and communities affect natural systems within cities as well as in more rural landscapes. Enhanced understanding of land-based human action and choice is needed within the entire landscape continuum.

Important Research Questions

Forest Service research has led the way in studying loss of open space and must continue its leadership role to address these questions:

- What are the patterns of landscape change and how are forests changing? Improved mapping and assessment tools are needed for assessment and prediction of urbanization, from city centers to wildland edges. How might local decision makers use such tools to better understand the outcomes of their land-use decisions?

- What are the forest changes associated with urbanization? We need more knowledge about changing forest structure and function, urban heat island effects, fire hazards, increased impervious surfaces, and ecological change.

- How do city trees improve urban livability and affect peoples' choices to live in cities? Infill development reduces new development in agricultural and forest landscapes. More information is needed about forest planning and management in high-density settings.

- What are the best strategies for well planned growth? Better policy, planning, and development tools can support economic development and minimize impacts on ecosystems and natural areas.

- What are possible new and innovative approaches to fuels and fire management in the urban-wildland interface? Traditional approaches of defensible space firebreaks, and prescribed burning must be supplemented with new tools.
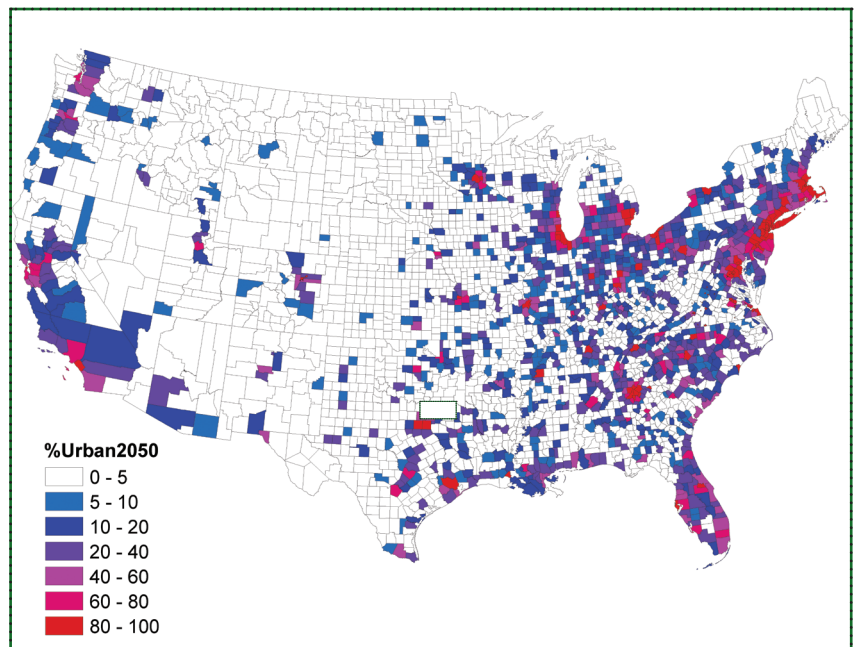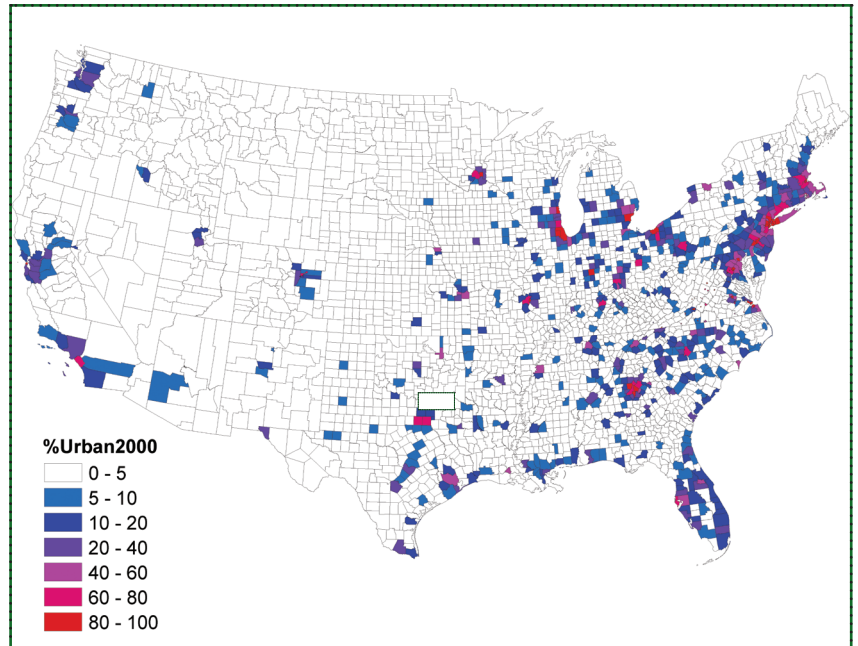
Urban land is projected to nearly triple in size between 2000 and 2050. These maps show percentage of county land classified as urban in 2000 (above) and projected to 2050 (below).

Goal 3 – Develop and deliver knowledge to mitigate and control invasive species and natural disturbances

The Impact of Pests and Disease

Thousands of exotic species have been introduced into the United States for productive or aesthetic purposes. About 5 percent of these species have proven to be invasive and are causing widespread harm. In addition, plant health in urban settings is declining because of destructive insects and diseases.

How Significant is the Problem

Infestations of land- and water-invasive plants have reached epidemic proportions. Increased global trade has aided introductions of damaging organisms from other nations. Changing landscape conditions enable domestic species to become threats. Chestnut blight devastated eastern hardwood forests in the early 1900s. Dutch elm disease resulted in the removal of millions of trees in urban and suburban areas. Today, urban trees and forests are threatened by pests such as the emerald ash borer, Asian longhorned beetle, gypsy moth, southern pine beetle, red oak borer, and hemlock woody adelgid; diseases, including sudden oak death, and plants, such as kudzu, ivy, and purple loosestrife. Invasive species cost Americans billions of dollars each year in economic damages and associated control costs.

Cities and towns also face other critical events that are threats to their forests. Fire, hurricane, wind, and ice have devastated urban forests across the United States. Greater knowledge is needed about first response actions as well as long-term, preventative, and damage management.

The Forest Service's invasive species and forest health protection programs are committed to protecting and improving the health of America's forests. Invasive species recognize no borders. Prevention and control of invasive species requires extensive cooperation across all landscapes, from urban settings to wildlands, and among private and public land stewards.

Emerald ash borer

Asian longhorned beetle

Important Research Questions

- What tools would enable early detection and eradication of new pests? national detection, reporting, and mitigation system has been developed and implemented for invasive insects and diseases. A similar effort exists for invasive plants. New or improved identification and detection and response technology are needed for invasive insects, diseases, and plants.

- What are the biological characteristics of existing and new pests? Knowledge about pest life cycles and natural controls is necessary. We know little about why some species are predisposed to becoming damaging pests.

- Can tree choice reduce impacts? Tree evaluation and selection are needed to identify species able to resist insect and disease problems and better withstand the effects of natural disasters.

- Can nurseries that supply trees for urban plantings be kept free of invasive pests and thus not serve as pathways of spread?

- Can management strategies reduce impacts? What practices can reduce the susceptibility of forests in cities and towns to threats from exotic pests and natural disturbances? More knowledge is needed about the basic needs of trees, including watering, fertilizing, pruning, and mulching.

- Can damaged ecosystems be restored?

Glossy buckthorn

Goal 4 – Expand understanding of how trees and forests enhance air and water quality and other environmental services

Urban trees intercept precipitation helping to replenish ground water supplies and reduce storm water management costs.

Many U.S. communities fail to meet the U.S. Environmental Protection Agency's (EPA) air-quality standards. Air pollution has significant public health and economic impacts. The EPA acknowledges that trees are one of the new innovative technologies that can be used to reduce atmospheric pollutants and improve air quality. Under the best conditions, trees remove up to 15 percent of the contaminants from the atmosphere. Large, healthy, vigorously growing trees generate maximum reductions in pollutants.

As communities grow, land becomes covered with impervious surfaces, such as buildings and pavement, diminishing rainfall absorption into the ground and increasing storm water runoff. Water supply is a critical issue in many metropolitan areas and is becoming critical in many others. Urban trees intercept precipitation within the canopy and the root zone. This generates two critical benefits—replenished groundwater supplies and reduced storm water management costs. Trees also provide other environmental services, such as carbon sequestration and energy conservation.

Important Research Questions

Additional research is needed to build on baseline knowledge about trees and environmental quality. Partnerships among the Forest Service, EPA, and the private sector should continue to explore these questions:

- How can communities maximize the effectiveness of new and existing forests in improving air and water quality? What is the role of trees in removing contaminants from air, water, and soil?

- How can storm water management be naturalized? Better strategies are needed to retain storm water for groundwater recharge. Tools for water collection and conservation are needed at the watershed and individual landscape scales.

- What are community-specific strategies for improving tree cover? Options can include planting new trees, preserving existing resources during development, and improving the health of existing trees.

- How can urban forests be managed for energy conservation? Tree and building placement is one aspect; bio-fuel development is another.

Are Trees Polluting our Air?

Trees produce a variety of chemical compounds that are released into the atmosphere. Some of these volatile organic compounds (VOCs) can be considered air contaminants.

Will removing trees from our nation's cities and towns improve air quality? No, the levels of VOCs produced by most trees are small, and the benefits provided by trees far outweigh the negative effects.

The bottom line is that healthy urban trees remove far more contaminants from the air than they produce. They have a strong net positive effect on air quality.

Goal 5 – Understand and implement urban forest systems and conditions to enhance human health and well-being

There is growing evidence that access to nearby nature and natural views is supportive of physical and psychological health.

People value trees in their communities. Humans respond to nature, green space, and landscape plantings in very positive, measurable ways. For example, research has demonstrated that patients who have a view of nature from their hospital rooms recover more quickly, require less pain medication, and have fewer complications than those with no natural views. Experiences of nature trigger responses that lead to improved health.

The Forest Service has been at the forefront of this field, supporting research by its staff scientists and by others outside the agency for nearly 30 years. Scientific findings demonstrate the clear link between our experience of nature and positive behavior. Dr. Stephen Kaplan of the University of Michigan writes, "There is growing evidence that … access to nearby nature and natural views is supportive of physical and psychological health."

At the Human-Environment Research Lab at the University of Illinois at Urbana-Champaign, scientists observed that symptoms of attention deficit disorder in young children were relieved after contact with nature. The link between experience with nature and positive behavior is present in adults as well and has been documented in diverse situations, ranging from less stress during commutes to work through natural settings to reduced violence at home when access to natural settings is available. Research has also shown that urban vegetation mitigates the psychological precursors to crime, such as irritability, inattentiveness, and impulsive behavior.

We should not be surprised to learn that people have strong attachments to trees and urban forests. Yet effective use of this emerging knowledge to create livable spaces in cities is in its infancy. We have only begun to answer all of the social questions concerning urban forests and how to apply such information.

Important Research Questions

- How do urban forests encourage physical activity in children and adults? The United States is experiencing an epidemic of obesity. What natural environments encourage more near-home activity? Collaborations with the National Institutes of Health and the Centers for Disease Control are possible.

- What is the impact of trees on healthy social functioning (for example, aggression control, altruism, and self-discipline) across all cultural groups and ages of people?

- What is the relationship of tree canopy coverage to exposure to ultraviolet (UV) radiation, particularly in children? Does canopy cover reduce skin cancer rates?

- Are there therapeutic doses of contact with trees and nature that optimize positive health, emotional, and psychological benefits?

- What is the economic value of improvements in human psychological and social function associated with urban trees and forests?

Goal 6 – Assess and implement community development and economic benefits through community-based planning and management of forests

Nature-based assets generate economic benefits retail shoppers are willing to pay more for goods in forested downtown business districts.

Trees, forests, and natural areas can contribute to the economic development of communities. These resources may not provide marketable goods, but they generate "human services" that promote economic growth. In an information-based economy, firms and workers are highly mobile. Initial research has determined that people will move to places offering high levels of amenities, including urban forests.

Empirical evidence suggests that nature-based assets generate economic benefits; the presence of trees and quality landscaping boosts residential property values and commercial rental rates. Retail shoppers are willing to pay more for goods in forested downtown business districts. Nature and trees have positive effects on individuals in the workplace. Office workers who have a view of nature from their work space feel more productive.

In some cases, citizen involvement in community greening leads to community empowerment that becomes a catalyst for other community improvement activities. These are important issues as community decisionmakers seek to improve the quality of life and well-being of urban residents. We must consider how to provide a range of outdoor experiences for people as more Americans choose to live in urban areas.

Important Research Questions

We need to improve our understanding of the economic consequences of trees in cities and discover how natural resources can be managed to more efficiently generate community development benefits. Potential research topics include:

- How might systems of urban parks and forests be managed to create more livable cities? What are the measurable indicators of quality of life, and how do natural areas improve human habitat?

- What are the effects of urban and community forests on real estate and rental prices in various markets across the country?

- How do urban forests contribute to the strength and economic stability of a community by attracting people and jobs?

- How can urban and community forestry support increased efficiencies and production for U.S. businesses?

- How does citizen involvement in urban forestry enhance social ties and community commitment? How are these social dynamics related to economic conditions?

- How do cities and organizations design and locate parks and green spaces to optimize neighborhood quality and real estate values?

Funding Recommendations

Funding for urban forestry research and related technology transfer efforts has been historically low relative to the constituency served. Urban forestry funding also has failed to keep pace with population trends and resulting forest issues. More than 80 percent of the U.S. population lives in urban areas and benefits from the forest ecosystems around them. Many regions of the country continue to undergo rapid urban growth and landscape change. Additional research is needed to respond to this dramatic shift in population from rural to urban areas.

Most urban forestry activity is conducted on nonfederal lands. Good technology transfer processes and products are essential. Effective translation of scientific findings for local decisionmakers and managers is needed to achieve best management practices and better science-to-action linkages. Technology transfer should be achieved using varied communications tools and collaboration with a broad array of potential users.

Ongoing communication about the measurable values of urban forests is an important research and technology transfer outcome. Demonstration of the measurable impacts of ecological and social services of urban forests will help all programs—federal to local—optimize returns on their urban forest investments.

Funding Needs

Federal funding historically has supported highly effective science and technology transfer efforts. Forest Service research has provided leadership in research and development concerning trees and forests in urban areas. Nonetheless, considering the impacts of forest threats and loss in urban areas and the need for improved information about the functions and benefits of urban trees, additional funding is needed.

Funding entities and targets are identified below. The federal government may not respond immediately to the funding targets; however, it is imperative that these targets be kept in the forefront of planning efforts. Periodic initiatives are needed to identify present and future research gaps. Science capacity should also be addressed through support of graduate students and young investigators to sustain research skills and infrastructure.

Estimated annual budget and budget targets for urban forestry research by the USDA Forest Service

FY 2004	FY 2010	FY 2015
$3.5 million	$12 million	$24 million

The Research and Development division of the Forest Service has supported urban forest science for more than 30 years. Nonetheless, urban forestry research has been a small part of the division's research effort for many years.

Funding patterns have been consistent from 2000 to 2004. The Forest Service has funded core urban forestry programs and centers at about $3.5 million per year—approximately 1.3 percent of total funding for Forest Service research. Additional station programs related to urban forestry, largely associated with forest health and fire management, have received from $2.5 to $3.3 million annually.

Research capacity and effort in urban and community forestry must be increased. Existing centers need increased support. New urban forestry research and development centers and labs should be created. Another strategy to consider is encouraging greater attention to urban science within stations or labs that have historically had a wildland emphasis. Funding should be raised from $3.5 million to $12 million by FY 2010 and $24 million by FY 2015.

Estimated annual funding, and funding targets, for technology transfer by the Forest Service State and Private Forestry division

FY 2005	FY 2010	FY 2015
$1.0 million	$1.6 million	$2.4 million

The Forest Service State and Private Forestry division supports technology transfer, a critical component of the research cycle. State and Private Forestry currently spends approximately $1 million annually in these efforts. Today there is more demand for technology transfer of research results than can be met, and even higher levels of demand for technology transfer are expected as new results are forthcoming. The Forest Service Urban and Community Forestry Program now has technology transfer specialists co-located with several Forest Service locations. An optimal arrangement would be for at least one technology transfer specialist co-located at each of the regional urban forestry location. Additional funding is needed to meet the demand with targets of $1.6 million in FY 2010 and $2.4 million in FY 2015 as short-term goals.

Other federal resources and collaborators USDA CSREES

FY 2005	FY 2010	FY 2015
$1.6 million	$8 million	$20 million

USDA Cooperative State Research, Education, and Extension Service (CSREES) funding is supported primarily by the McIntire-Stennis Cooperative Forestry Research Program. This program supports all aspects of forestry research, primarily at the university level. Only a small portion has been historically devoted to urban forestry. In FY 2001, CSREES reported spending $1.6 million for parks/urban green space (urban forestry) research. From this investment, only $257,000 was attributed to the agency appropriations. The balance resulted from fiscal resource leveraging with state, private, and other federal sources.

Universities and associated institutions are the training ground for a new generation of scientists. If research capacity is to be maintained, there must be adequate support for urban and community forestry research at the university level. Moreover, universities extend the range of disciplinary expertise available to the Forest Service. Funding to CSREES programs should be increased to $8 million in FY 2010 and $20 million in FY 2015.

Urban forestry research is being conducted by other federal agencies and organizations, including the EPA and the U.S. Department of Energy. New collaborative efforts are under way with the U.S. Centers for Disease Control and the U.S. Department of Housing and Urban Development. Additional collaborations should be considered with public health, urban planning, housing, and commerce departments and agencies.

Nonfederal Resources and Collaborators

Little is known about urban forestry funding beyond that provided by the federal government. A 1995 report showed that nongovernmental organizations—largely arboretums, associations, and institutions—spent about $1.5 million annually on urban forestry research.

No current information is available about university spending, although the nation's forestry school leaders have repeatedly cited urban forestry as an underserved specialty in the forestry discipline. Additional funding of extramural scientists is needed.

The federal government could provide impetus to increase funding to collaborators. For instance, more cost-share grants can be provided. Universities and nonprofit organizations could increase the size of their urban forestry programs to take advantage of this funding source.

The need for urban and community forestry research, development, and technology transfer parallels the need for a sustained environmental and social quality of life in cities. Both the public and private sectors' support of urban forestry science has grown, but the response has not kept up with demographic and land-use trends. Strengthened and continued investment will provide a great and enduring return in knowledge, management strategies, and realization of the many benefits that urban forests provide.

Report Resources and References

This research plan is the culmination of a comprehensive review and incorporation of diverse inputs:

- Two documents summarized urban forestry research needs identified by representatives of federal, state, and local agencies, managers, nonprofit organizations, interested parties in the private sector, and universities: (1) An Assessment of Current Research Needs and Technology Transfer Needs (2002); and (2) A Revised National Research and Technology Transfer Agenda for Urban and Community Forestry (2003). Each report was commissioned by the National Urban Community Forestry Advisory Council and is utilized in this report.

- Interviews with directors of Forest Service Urban and Community Forestry programs, including Research and State and Private Forestry.

- Feedback from a technical review team comprised of Forest Service and nonfederal stakeholders.

- Review and incorporation of direct portions of additional key reports and publications, including Forest Service reports, national assessments of forestry research (National Research Council and National Association of State Foresters), Forest Service Urban and Community Forest regional reports, and scientific journal articles.

For More Information

US Forest Service Urban Forestry Research & Resources

Northern Research Station
Urban Natural Resources Institute: *www.unri.org/*
This site contains links to our research teams in Syracuse, NY; Chicago, IL; Baltimore, MD and New York City.

Pacific Southwest Research Station
Center for Urban Forest Research – Davis, CA: *www.fs.fed.us/psw/programs/cufr/*

Southern Research Station
Southern Wildland Urban Interface – Gainesville, FL: *www.interfacesouth.org/*

Recreation, Wilderness, Urban Forest, & Demographic Research Trends – Athens, GA: *www.srs.fs.usda.gov/trends/*

US Forest Service State & Private Forestry – Urban & Community Forestry
www.fs.fed.us/ucf/
www.na.fs.fed.us/urban/index.shtm

Forest Service Forest Health Program
www.fs.fed.us/foresthealth/publications/Invasive_Species.pdf

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Additional Online Resources

National Urban & Community Forestry AdvisoryCouncil: *www.treelink.org/nucfac/*

TreeLink – Urban Forestry Internet Links, Publications, and Resources Gateway: *www.treelink.org*

iTree – Urban Forest Assessment Tools and Information: *www.itreetools.org/*
Human Dimensions of Urban Forestry and Urban Greening – University of Washington: *www.cfr.washington.edu/research.envmind/*

Landscape and Human Health Laboratory – University of Illinois: *www.lhhl.uiuc.edu/*