

# USDA FOREST SERVICE PROGRAMS TO SUPPORT URBAN FOREST RESOURCES

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Since 1905, the United States Department of Agriculture's Forest Service has been manager of the nation's forests and wilderness resources — 187 million acres (75.7 million ha) in national forests and grasslands. Except where excluded by law, these lands are managed for multiple products like recreation, wildlife, range, timber, and water. The Forest Service also cooperates with state forestry organizations to organize technical and financial assistance programs that improve forest management on 1.4 billion acres (0.57 billion ha) of private and non-Federal public forest and rangelands throughout the country.

The Forest Service operates a research program through a nationwide system of 8 Forest and Range Experiment Stations and a Forest Products Laboratory. Over 150 units conduct mission-specific research to learn more about how to manage and use the nation's public and private forests and wildlands to more effectively meet a wide variety of demands. The goal of one part of this research program is to develop knowledge to better manage urban forest resources to maximize the benefits that this resource can contribute to the well-being of urban residents.

Before describing the scope of this Urban Forestry Research Program, we should discuss what we mean by the urban forest. What are foresters doing in cities? And how ever did they get there?

## The urban forest

First, we should note that tree cover has always been an important part of the urban environment. The difference is that we now recognize the many values that these urban tree resources can produce, and we are more aware of the growing need to manage urban trees and associated vegetation — the Urban Forest — as a system to produce these desired benefits.

Where is this urban forest? It occurs everywhere in and near cities. It is owned by many different kinds of people and institutions (both government and business), and it is influenced by a wide variety of interests. Like the rural forest, but perhaps even more so, the urban forest is subject to many diverse pressures — pressures that threaten its very existence!

The urban forest occurs as an interconnected system throughout most cities. It occurs along streets and sidewalks, power lines, pipelines, utility rights-of-way, transportation corridors, as trees in small groups occupying vacant lots or preserves, and in backyards. Segments of the urban forest often link larger areas of forest cover in parks, preserves, arboreta, municipal watersheds, cemeteries, and undeveloped land typically found throughout the urban system. All of these components added together make up the urban forest. This urban forest resource, like any other resource, can be managed to produce a variety of desirable benefits.

How large is this resource? Studies show that 50% of the land area in the average American city is open — not covered by structures or hardened surfaces — and is capable of supporting vegetation. How much actual forest cover is there? Estimates vary, but, when viewed from above, a conservative estimate is that 30% of the surface area of an average U.S. city is covered with trees. This is a larger portion of forest cover than is found in the typical countryside! Because it is so diverse, the job of managing the urban forest is exceedingly complex. Among the factors adding to this complexity are: the high value of urban vegetation and urban land; the relative scarcity of forest and open space resource in relation to other urban demands; heavy use pressures; stress imposed by a man-dominated environment; unrelenting pressures for urbanization; and high public visibility and often diverging interests about appropriate land use. Because of these factors, the person responsible for managing the urban forest resource has a job that is probably more complex than the manager of more remote forest resources.

## Management of the urban forest

Who is responsible for managing the urban forest? Many different professions, government agencies, and individuals have roles to play in

managing urban forests. "Urban forestry" is not a precisely defined profession but a conceptual framework through which many specialists can direct their talents toward a common goal: to plan, manage, and protect urban forest resources in order to produce the largest quantity and highest quality of desirable benefits. There are many agents that influence the urban forest system. Private companies have been in the business of planting and caring for urban trees for many years. Utility companies, while providing needed services, attempt to manage urban vegetation to better the environment. Add large corporate landowners, managers of public forests and open space resources and, perhaps most important, individual property owners with their backyard "forests," and we begin to get an idea of the diverse groups that influence the urban forest.

Many different kinds of professionals, trained in the tools of their profession, contribute to planning and management of the urban forest resource. For example: The landscape architect is concerned with enhancing natural beauty; the regional or urban planner integrates planning for urban forest values with comprehensive urban development; the horticulturist is concerned with the physiological processes that occur between a plant and its environment; the arborist, the wildlife manager, the forester, the recreationist, and many other professionally trained people are concerned with manipulation of those components of the urban forest that produce benefits related to their profession. Thus each profession contributes its specialized talents toward fostering better management of the entire urban forest resource system.

The urban forest, then, is the part of the urban-suburban area made up of forest and associated vegetation, water, soil, wildlife, and related open space resources. Management of this resource is the process through which multiple, long term benefits are produced for the benefit of urban society.

Urban forest management, and research to support management, involves 4 components: 1) Defining and evaluating benefits; 2) determining and enhancing processes through which urban forests produce benefits; 3) developing better systems to physically manage and protect urban forest resources; and, finally 4) integrating sound urban forest planning and management with the urban development process. Activities within each of these components are described next.

## Defining and evaluating benefits

There are many benefits in which all people share from properly managed urban forests. There are also some negative effects from urban forests such as clogged sewers, broken sidewalks, acts of vandalism, and destructive effects of wildlife. One of the goals of urban forest management is to maximize the positive benefits, while minimizing these negative effects. Some benefits that can be attributed to trees and forests in cities can actually be measured in dollars and cents. For example:

- Trees provide economic benefits — they can increase housing values by as much as 20%.

- When used as windbreaks and for shade around homes, trees can reduce fuel used for indoor space conditioning by 10 to 20%.

Other benefits can be measured but not in monetary terms. For example:

- A 4-foot (1.2 m) wide band of trees can reduce noise by 25%.

- Urban forests can improve air quality by intercepting from 27 to 38% of particulate material and removing 9 to 13% of gas-like suspended particles from the air.

- A typical 40-acre (16 ha) city park can provide over a million visitor hours of recreation per year — more recreational use than provided by the average rural forest recreation areas many times larger.

Other benefits, although real, cannot be measured easily. For example, what is the value of a pleasant urban landscape that is enhanced by diversity and presence of trees? What about the value of a moderated climate — cool shade and reduced wind — due to the presence of trees? How about a quieter, more tranquil environment? What is a diverse population of songbirds and other wild creatures that grace the urban landscape worth? And, what is it worth to an entire urban community to have a higher quality environment, a place where people can experience and benefit from nature first hand, while never leaving the

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urban setting? And what are these things likely to be worth as energy becomes more costly and more scarce?

Even if they cannot be measured, few would argue that benefits from well managed urban forests are not worth the estimated \$15 billion Americans have invested in their municipal street trees and the \$200 million spent annually to care for them. If privately owned and other publically owned urban forest areas were added, these figures would be at least 4 times higher! But much research is needed to identify and quantify the variety of benefits from urban forests so that management for urban forest values can compete successfully in the tough urban marketplace.

Resource managers produce benefits by manipulating biological and physical components of the urban forest system. Once we understand how these components interrelate to produce a particular effect, such as noise reduction, the urban forest can be planned and managed to produce the desired result. Urban forest managers have always known that urban trees enhance urban environments, but it is only recently that research has begun to develop methods to increase the quantity and range of benefits through improved management practices.

The process of managing and protecting the urban forest system is as basic to producing a desired benefit, like enhanced air quality, as the proper functioning of an automobile is basic to reaching a desired destination. Management and research activities important to the health and operation of the urban forest systems include: selection and development of trees that will tolerate stress imposed by the urban environment; production of nursery stock; and development of ways to plant, grow, protect, maintain, and manage urban trees.

But even when we know how to measure benefits, manage for desired benefits, and protect urban forest resources, we still need to know how to incorporate this information into the overall urban development process — a process that is in many ways hostile to the operation of a natural vegetative system.

In the urban setting, where the needs of man dominate, the way to insure that maximum benefits are obtained from urban forests is to devise ways to effectively mesh urban forestry planning and management with the comprehensive urban development process. This requires not only a thorough knowledge of urban forest benefit-producing capabilities and the values involved, but a system for information exchange and ways to assure public participation in all aspects of urban forestry planning and management.

### Forest Service research in urban forestry

Coupled with adequate program funding, a key to ensuring a high level flow of benefits from urban forest resources is to develop new management and planning systems and technology through research. Urban forestry research in the Forest Service is done through Research Work Units located at 6 locations throughout the country. Each unit consists of scientists and support staff who conduct research within an assigned unit mission. Much of their work is done in cooperation with university researchers. Although there is some research overlap because of geographic variation in components of a specific problem, each unit mission is different. All urban forestry research is done within the bounds of a National Research and Development Charter. The Charter outlines a 10-year program of research needs for all aspects of urban forestry. The goal of this program is to find better ways to manage urban forests so as to enhance long-run production of the widest possible array of benefits. To date, only one-quarter of the research needs outlined in the Charter are being studied. The remainder will be addressed as funds and personnel permit.

Research within each unit is done by unit scientists, university cooperators, and other cooperating public agencies. Following is a brief overview of research activities of the 6 units:

*Berkeley, California.* This Unit operates in urban areas of the Pacific Coast and Southwest. It identifies forest trees and related woody vegetation that is adaptable to urban areas in the region and helps design urban land use systems to maintain and protect urban forests. An important aspect of this unit's work is developing methods to involve urban residents in urban forest planning and management activities.

*The heavily urbanized Northeast.* The Forest Service has 3 research units, at Amherst, Massachusetts; State College, Pennsylvania; and Syracuse, New York. At Amherst, scientists are studying urban landscapes and the recreations, wildlife, economic, and environmental benefits from urban forests. This effort seeks to improve the urban environment of the Northeast through better understanding of the social amenities that urban forests can produce. Research at State College is directed toward developing forest management guidelines for improving the metropolitan environment along the Atlantic Seaboard from

Boston to Washington, D.C. Their research deals with developing management systems to reduce noise, moderate climate, reduce home energy consumption, and improve air, soil, and water production from urban forests. In short, they are concerned with the physical environment as it affects and is affected by urban forests. At Syracuse, scientists are looking for ways to plan and manage urban forests by developing a better understanding of the relationships between urban land use and the ecology of urban vegetative systems.

*The Southeast.* The Forest Service Unit at Athens, Georgia, emphasizes research to identify and measure urban forest benefits. Another objective is to increase the benefits from urban forests through careful selection and use of tree species best adapted to urban environments found in this part of the Country.

*The Midwest.* The shortage of open space for outdoor recreation is greater here than in any other part of the country. The unit at Chicago, Illinois, is attempting to improve the management of urban forest resources to enhance recreational opportunities available to urban residents.

### Forest Service urban forestry assistance programs

The objective of the Forest Service Urban Forestry Assistance Program is to improve the quality of life (environmentally, economically, and esthetically) in urban areas. Urban forestry assistance is provided under authority of the Cooperative Forestry Assistance Act, section 6. Assistance includes educational and technical urban forestry assistance to state and local government units. The cost of these activities is shared by state forestry agencies (or through subgrants to local government units and others) and the Forest Service.

Technical assistance is provided for a wide array of activities, including planning, establishing goals and objectives for urban forest resources; tree planting; and advice and training in the selection of species, including care and maintenance. This program includes assistance in the management of the urban forest resource (e.g., pruning, removal, pest control, stress testing, etc.). Advice is also provided for the marketing and disposition of urban wood wastes and for demonstration projects and pilot tests, including species adaptability, cultural practices, management alternatives, and urban tree evaluation. The Forest Service also supplies assistance in the promotion of special programs, including Arbor Day and Tree City USA and for urban development or renewal, including advice on the protection and management of the existing urban forest resource in both urban areas and potential urban areas. Training is provided in a number of areas including the promotion and presentation of training sessions, workshops, and seminars to develop and expand the expertise of any and all personnel, in both the public and private sectors.

### The future

At present, the Forest Service Urban Forestry Research and Cooperative Programs are small in comparison to other Agency programs. But, as future demands for urban forest benefits grow, and there is little doubt that this will occur, these programs will be expanded in number of units and scope of activity. Greater emphasis will be placed on research needed to care for and protect urban forest systems and to develop management systems that include all components of the urban forest — trees and associated plants, soil, water, and wildlife — and the manmade structures that influence the entire system. How can we be sure that the importance of urban forest resources will grow in the future? Here are just a few reasons:

1. People are moving to cities and many public programs will be directed toward cities.
2. Political influence is shifting toward urban areas, along with population.
3. Energy availability and its growing cost is shifting demands from rural to urban areas.
4. Tree insect and disease attacks (e.g., dutch elm disease and gypsy moth) have increased public awareness of the value of urban forest resources.
5. Urban-suburban-rural expansion has created more manageable open space near the urban fringe.
6. Urban areas are being renovated.
7. Zoning and new land development systems have created more open areas in and near urban areas.
8. Public concern for environmental values is growing.
9. The physical form of the typical city is changing — cluster housing, the move toward multifamily dwellings, increased public transpor-

tation, etc. — creating new manageable urban forest and open space resources.

### Summary

Those responsible for management and planning of urban forest resources must strike a balance between the needs of people and the ability of urban forest systems to fulfill these needs. Through development of new research knowledge and technical assistance, the USDA Forest Service is trying to do its part to improve the capacity of urban forest resources to produce needed benefits.

Urban forestry is really nothing new — it is merely a way to coordinate and plan the many activities that affect, and are affected by, urban vegetation. The “urban forester” manages the vegetation, soil, water, and wildlife components of the urban forest system to create a more comfortable and healthy urban environment — an environment made more appealing by altering some of the glass and concrete monuments man builds to signify his dominance over nature. Urban forests are an extremely valuable resource and their importance will increase. Through proper management, they can produce a continuing flow of benefits for centuries to come.

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## DEVELOPING COOPERATION BETWEEN LANDSCAPE ARCHITECTURE AND HORTICULTURE

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The concerns that I wish to address are ones I have been discussing for a decade. As a student at the University of Georgia, I was in the Department of Landscape Architecture and the College of Agriculture. It is interesting to note that at that time, I did not know a Department of Horticulture existed at The University of Georgia. Unfortunately, this is still the situation on a number of campuses today. At both Georgia and Harvard, the landscape architecture student is taught plant material by a member of the landscape architecture faculty. Yet at many other schools, horticulture faculty teach such courses.

I was introduced to academic practice at Cornell University as a faculty member in the Department of Ornamental Horticulture. Because I was somewhat foreign to the group, it was a strange and interesting situation which I entered. I was an artist and they were scientists. In any event, experience showed each could strengthen the other by working together — we needed each other. The experience at Cornell was extremely broadening. During my stay, I learned about the expertise, needs and desires of horticultural scientists. I did not learn enough, but I did learn some.

Since arriving at The Ohio State University in 1972, I have worked to foster a working relationship between the Department of Landscape Architecture and the Department of Horticulture. We feel such a linkage is critical and continually strive to strengthen and even enhance our working relationship. Unfortunately, such a relationship requires the active support and interest of several faculty in both areas. Each of us must be willing to take the extra time required to set up classes which include study and faculty from the “other” department. Each of us must consider the suggestions and constructive criticism of those from the “other” area. Each of us must be willing to spend time learning about the commercial and academic practices of the “others”. Yet, even on the Ohio State University Campus, we find little reciprocity for such efforts.

Many students, after a summer work experience with a landscape architect tell horror stories involving an unfortunate experience with nurserymen. I try to tell students that to base perceptions and attitude on single incidents is a sad, serious mistake. Michelangelo left us a great many very beautiful works of art. Without his hammers and chisels and granite, Michelangelo would have left no great sculpture. As a landscape architect, my hammer, chisel, and granite are the people who make up the landscape industry — the horticulturists, field production personnel, landscape contractor, and landscape maintenance personnel. Without them, my work will not get built. As President of the American Society of Landscape Architects I have been trying to transmit this attitude to other landscape architects throughout the United States.

Unfortunately, a great deal of additional work must be done in order to build better working relationships between the two disciplines. We need a reciprocal effort from the horticulturist.

### The landscape architect

I like to think of Landscape Architects as creators of gardens. In my dictionary, garden is defined as: 1) A plot of ground where herbs, trees, flowers, and vegetables are cultivated. This is the definition a majority of the American public thinks of when the word garden is mentioned. There are three other definitions for garden in my dictionary: 2) A rich, well cultivated region, 3) a public recreation area and

park, and 4) an open air eating or drinking place. If each of my landscape architectural projects becomes a rich and well-cultivated recreation area or park for eating, drinking and meeting your fellow citizens, I will have done my job well — I will have created a garden. Unfortunately, as a result of Sputnik, a great many landscape architects trained in the era of the 1960s and practicing or teaching today have tried to divorce themselves from the classical roots of landscape architecture. They have denied the need for the relationship to the horticulture industry.

Let's take a look at the landscape architect today. Unfortunately, most people in the horticultural industries see only the tip of the iceberg. There are between 20 and 25 thousand graduate landscape architects in the U.S. We have a national organization called the American Society of Landscape Architects (ASLA). It is the only national organization representing the profession. ASLA unfortunately has only about 5,000 active members. While this is a relatively small percentage of the graduate landscape architects, the number represents more than a 50% gain since 1976. ASLA has 40 local chapters, one in virtually each state. There are 38 landscape architectural licensing laws. In my judgement, we need 12 more. We need to change from title law to practice law in 17 states. I do believe, because of the technical knowledge and specialized training required to accomplish most landscape architectural projects today and the subsequent impact on the public health, safety and welfare the individuals practicing landscape architecture should be licensed. Others working with the land have not proven through examination they have the required skills or knowledge to properly protect the public.

There are 40 accredited landscape architecture programs in the U.S. Programs, not institutions or departments, are accredited by ASLA. This is less than half of the 90 U.S. programs which teach major courses in landscape architecture. It is expected that 4 or 5 additional programs will be accredited in the next couple of years. More than half of the accredited programs are associated with land-grant colleges. I see the 1980s as unique period for these programs to address change. The 1980s will not see a significant decline in student numbers at most land-grant colleges and universities. Landscape architecture programs may be little affected by declining enrollment or shifts in interest, because the vast majority of landscape architecture programs work under a quota system, and admit a limited number of students each year. Currently, only 25 to 50% of the students applying to Landscape Architecture programs are admitted. About 1,200 individuals graduate with a Masters or a Bachelors degree in Landscape Architecture each year.

If we were graduating 2,000 to 3,000 students per year we would still not be meeting the market needs. Students seem to think if a recruiter is not knocking on their door that there are no jobs available. Evidence suggests there are probably more jobs than graduating students; however, the students must take the initiative and go out and seek employment. In my opinion, hiring practices in landscape architecture and the “Green Industry” are handled in an archaic manner. It is extremely difficult for students to find the available jobs. They must go to strange areas of the country, pick up the yellow pages and start knocking on doors — an extremely inept and inefficient way of handling recruiting. The industry currently places the burden of finding a job on the student and then complains qualified people are not available. To obtain qualified graduates, the industry must learn to visit and recruit on campuses.

Another concern in landscape architecture is the diversity within the profession, itself. In landscape architecture there are currently several hundred professionals who call themselves regional landscape

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