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## URBAN FORESTRY RESEARCH<sup>1</sup>

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The U.S. Forest Service in cooperation with other agencies and institutions is undertaking a national research program aimed at further developing management technology in urban forestry. The scope of this program is broad, as is our definition of urban forestry. As a result, the users of our research findings are expected to be from a very diverse mix of urban management and planning interests.

We have defined an urban forest to include the same natural components of our ecosystem as are included in the definition of a rural forest, that is, vegetation, water, soil, and wildlife resources. The difference is, of course, that urban forest resources occur in densely populated areas and adjacent lands. This means that we are concerned with every problem and resource interaction with which rural forestry research is concerned. But as you so well know, we must also be concerned with much more.

Urban forest management is the process through which multiple urban resources are manipulated to provide long-term benefits to society. Our research is aimed at increasing our basic understanding of resources and people and at improving, developing, and testing alternative management techniques for effectiveness in achieving improvements in the urban environment. Thus, the research program recognizes that the ultimate aim of urban forestry is improvement of the urban environment for human habitation.

The research being undertaken will also evaluate short- and long-term indirect consequences of alternative urban forest management strategies. These indirect consequences may include changes in property tax distribution,

changes in transportation patterns and costs, and changes in human attitudes toward natural resources and toward one another.

Definitions of urban forestry vary. Some are limited to the breeding, selection, growing, and protection of trees; others are broad and include comprehensive management of all resources within the city as well as within the urban influence zone. Our definition is toward this broader conception and is based on the fact that total resource management is necessary to achieve desired changes in the urban environment. Obviously, the focal point is trees, but research will also focus on human interactions and reactions, as well as educational and public involvement processes.

The broad scope of concern of the research program means a varied clientele. There is a commitment to assist the urban forester who is charged primarily with managing trees in cities. Urban foresters usually are professionals employed by state forestry agencies or by local governments. Next there is a commitment to provide information to cooperative extension and consultant interests. But there is also a need for and a commitment to provide research-derived information for municipal, county, and state land-use planning interests; for land developers; for park and recreation agencies; for traffic and energy planning agencies, and for a variety of other urban interests.

### National Perspective

Last year we developed a national program of urban forestry research and development. This program addresses four basic questions:

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1. How can we best use genetics improvement, species selection, and cultural and protection techniques to achieve desired states of the urban forest system? States of the urban forest include amount, density, geographic distribution, species mix, size, age, and rate of increase or decline. Basically, this question involves arboriculture and hopefully the funding derived to support this area will further assist those of you who have been involved in arboriculture research for years.
2. What and how much positive change in the condition of the urban environment can be achieved through manipulating the amount, location, density, species mix, age, and size of urban forest vegetation? Conditions of the urban environment include climate, noise levels, air quality, water quality and quantity, aesthetic quality, and effects on energy consumption and recreation opportunity. These conditions can be changed through manipulation of the urban forest. The question, restated, is which of these conditions can be changed sufficiently to warrant concentrated attention by urban forest managers.
3. What kind and how much social benefit can be achieved through modification of conditions of the urban environment, both physical and aesthetic? This is the third tier in the framework of cause-effect relationships. It is the ultimate tier, and is, in fact, the reason for urban forestry. We practice arboriculture and otherwise manage urban forests to change the conditions of the environment so that benefits to humans can be derived. We need to know much more about these benefits.
4. How can sound urban forest management principles be integrated with urban planning and management processes? Obviously, without good knowledge of the opportunities and constraints which exist in the "real world," our research may be useless. Development and testing of educational, demonstration, and involvement programs are planned to help answer this question.

This fiscal year Congress provided initial funding for this program. Although the amount provided is far too little, it is a start. Four forest Service Experiment Stations are involved: The Pacific Southwest, North Central, Northeastern, and Southeastern. The PSW project is located at Berkeley, California; the NC project at Chicago; the NE projects at Amherst, Pennington, and Syracuse; and the SE project is at Athens, Georgia. These projects will conduct research in the following general areas:

**Berkeley.** Identify forest trees and related woody vegetation adapted to the region; develop tree cultural practices and protective measures; design land use control systems and policies to maintain and protect urban forest including associated developments; develop technical information systems to serve urban forest managers and develop theory and methods for informing and involving urban residents in the urban forest planning and management processes, including development of knowledge of the relationship between people and trees. The scientists in Berkeley are Al Wagar, (Project Leader), Art Magill and Phil Barker (415-486-3567).

**Chicago.** Develop understanding of the recreational needs of urban people and methods for assessing such needs; define the processes by which people express needs as recreational choices; explain how urban forests can satisfy recreational needs; and design and test alternative strategies for satisfying recreational needs through scientific management of urban forest resources. The scientist and project leader at this location is John Dwyer (312-588-7650).

**Penn State Univ.** Investigate climatic, acoustical, and water quality benefits from urban forests and improve vegetation selection for growth in stress environments. The investigators are Howard Halverson, (Project Leader), Silas Little, Edward Corbett, and Gordon Heisler.

**Amherst.** Evaluate urban landscapes, estimate recreation benefits, develop methods for economic evaluation of trees, and improve urban wildlife habitat. The investigators are Dick Degraaf, (Project Leader), Laverne Dickerson, Bob Brush, Tome More, and Robert Williamson (413-549-0520).

**Syracuse.** Model relationships between natural resource, physical and social factors and develop concepts and methods for inputting these factors and factor relationships, in the form of scientifically valid management and planning criteria, into the urban forest and land use planning process. Develop systems for monitoring technological change in urban forestry and for inputting these changes in urban forest decision making. The scientist and project leader at this location is Rowan Rowntree (315-473-8608).

### Urban Forestry Research at the Southeastern Station

Our project in Athens, Georgia, has primarily a regional mission. That mission is to develop methods and criteria for establishing, retaining, and managing forest resources in developing and existing urban areas and to evaluate the nature and level of benefits from urban forest management.

One of the principal criteria for managing urban forest resources will be developed through research to understand the ecological consequences of alternative management strategies. The goal will be to provide research-derived information which will help prevent social and land use problems in the urbanizing areas of the South. The opportunity to prevent problems, such as are now pressing upon the heavily populated portions of the Northeast, Midwest, and Southwest, is at hand for the South. We have not yet fully established our priorities for research, but the following problem areas have generally been identified:

1. Identification and measurement of the ecological, economic, and psychological benefits derived from urban forest space, vegetation, and management.
2. Establishment, maintenance, and protection of urban trees in stress environments with primary emphasis on native species.
3. Development of criteria for using and selecting tree species for home and commercial energy conservation.

As you will note, one of these problem areas focuses directly on human benefits from urban forestry. This represents an explicit recognition of

the need to understand our ultimate clientele, the urban resident and worker and the political and social systems within which they reside. This type of information is essential for making better urban forest management decisions.

An example is research which I recently completed dealing with urban open space. Specifically, this research addressed the question of whether there is a relationship between governmentally owned and managed open space (parks, greenbelts, and other urban forest space) and privately owned open space (residential lots, private golf courses, and other private urban space and forest areas). Generally, city councils, urban planners, and others with public space acquisition authority do not behave as if there is a relationship. In other words, there is an implicit assumption that public land acquisition and management decisions are completely independent of private decisions by urban residents, land developers, and other private concerns. When land is acquired by public agencies for park, recreation, or greenbelt purposes, there seems to be almost no assessment and accounting for already existing or planned-for private green space in the form of residential lots, apartment grounds, community common parks, recreational club lands, and other forms.

The research I mentioned showed that there is a definite relationship between public and private urban open space and that government should take explicit account of what the private sector is doing. Point number *one*, private open space, for those who can afford it, generally is preferred over public space. Thus more public forest space generally should occur in low income areas. This is not usually what happens. Most new acquisitions of parks and greenbelts seem to occur in suburbs where population expansions will occur and where land prices are lower. But this is not where low income families will reside.

Point number *two*, zoning to control residential lot size, should account for amount of public space existing or planned; generally, the more public space there is, the less private space is needed. But this usually isn't acknowledged either.

Point *three*, increases in the amount of public

forest space in an area changes land prices and thus the development pattern of urban land. These changes are usually ignored when public forest purchase decisions are made.

There are other implications of equal importance from this research. But the important point this makes is that a balance is needed in urban forestry research between strictly biological studies and more social oriented studies. We will try to achieve some of this balance in an attempt to better understand the *total system* with which we are working.

Some of the specific studies we now have underway include:

1. Assessment of the social benefits of trees in urban areas with emphasis on noise perception by humans as affected by different amounts of vegetative cover.
2. Estimation of the economic value of urban trees.
3. Evaluation of the use of trees to reduce energy consumption for heating and cooling urban homes.
4. Testing the growth of mycorrhizal-tailored tree seedlings in urban stress environments.
5. Survey and assessment of insect and disease problems on urban trees in the South.
6. Comparison and case studies of successful and unsuccessful tree planting and care practices.
7. Effectiveness and cost of wood-chip mulching for improving the structure, composition, fertility and micro-organism content of urban soils.

Other major activities of the Athens project include the Urban Waste Wood Utilization Symposium (March 26-28, 1979), planning a southern urban forestry conference, and development of clientele urban forest research advisory groups.

### **The Need for Cooperative Action**

One of the principal characteristics of the planned urban forestry research is that it is intended to be a cooperative venture between the Forest Service, universities, management agen-

cies, and consulting interests. From the initial stages of the development of the national program, there has been a strong realization that a cooperative program is needed. We intend to accomplish this goal by three means.

First, the Southeastern Station will seek to build a core staff of Forest Service scientists and technicians to conduct urban forestry research on a continuing basis. Recently, Linda Anderson, who is a psychologist, has joined our project staff. On the drawing boards are slots for plant ecology and entomology.

Second, a large share of the research expertise and work will be forthcoming from talented and interested universities in the Southeast. We will jointly plan, design, and conduct studies which address specific high priority management questions. Thus, we will not seek to develop a totally self-contained research expertise. Rather, the strategy of sharing the costs and efforts to address problems of importance will be developed with key universities. Currently we have cooperative studies with Clemson University, N.C. State University, and the University of Georgia.

Our third and perhaps most important means will be to seek cooperative action with management agencies and consulting interests. Joint research and development projects, workshops, and field-level studies have proved to be very effective. Where management interests actually participate in planning and conducting research, we achieve a better targeted program, more applicable research results, and a more receptive clientele. We are very excited about the expressed interest by some of the southeastern municipalities and state forestry agencies.

The researcher must have feedback from urban foresters who are in contact with management situations on a daily basis. In turn, the urban forester can benefit from research information and techniques which fit more closely the daily problems he faces. In some instances, the urban forester can greatly assist by providing data collection and evaluation assistance. By participating in the research, the manager gains a better understanding of its application. In other instances, the researcher may be able to provide

general interpretation of recurring, but seemingly isolated, problem symptoms. And, very important is the practicing urban forester's capability to provide on-the-ground tests of new research results to determine their practicability and reliability.

### **The Role of a Researcher**

As a conclusion, I want to speak briefly about communications, research, and management relationships, and especially relate these to the role of the urban forest researcher. My statements earlier about the need for cooperative action to achieve urban forestry research were sincere. But unless we both understand certain basic truths, this cooperative action may not work well, or perhaps will not work at all.

Researchers are often criticized for not being heavily involved in actual management situations on a more routine basis. To an extent, I believe this criticism to be valid. But we must jointly understand two things before we try to improve this situation. Number one, the basic reason for close communication between a researcher and a manager is to provide the researcher with a better understanding of the intricacies of the problems needing research. The purpose should only rarely be to provide direct technical assistance.

Number two, relative to the number of managers and consultants, there are very, very few researchers. The ratio may be as low as 1 to 500 (a guess) or even lower.

In order to have adequate time to accomplish our job, we can become involved in on-the-ground problem situations and one-to-one interactions only infrequently. Obviously, researchers could in-

crease involvement with management interests to such an extent that the research job would not get done. Fortunately, the Cooperative Extension Service, the State and Private Forestry Division of the Forest Service, the Soil Conservation Service, other agencies, and private consulting firms are in the business to, among other things, provide a communication linkage between research and management. There also are too few of these personnel, but the roles they play as communicators are extremely vital.

We must, then, have a common understanding of the role the researcher is supposed to perform. He experiments, tests alternative management strategies, provides facts, and sorts through a variety of related facts in an attempt to develop a general picture of the workings of our natural, economic, and social systems. This is done to provide information for better managing urban forest resources. Researchers cannot be expected to make direct inputs into management, except in unusual circumstances.

One of the better ways through which management and research interests can communicate is at meetings such as this one and the National Urban Forestry Conference to be held in Washington, D.C., in November 1978. I personally am looking forward to interacting with the various arboricultural and urban forestry interests who will participate.

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## **ABSTRACT**

Nielsen, D.G., M.J. Dunlap, and J.F. Boggs. 1978. **Progress report on research in black vine weevil control.** Ohio Report 63(3): 41-44.

The black vine weevil has been a destructive pest of woody ornamental plants in the United States for many years. Young larvae consume small feeder roots while becoming established and eventually strip larger roots cutting off the supply of water and minerals to stems and foliage. The relatively new practice of overwintering containerized nursery stock in polyethylene-covered houses in colder regions of the U.S. provides black vine weevil with a place to develop during winter months. During the past 2 years we have conducted chemical control investigations and other studies to provide new information regarding the biology and seasonal history of this pest in hopes of learning how best to approach its control.