

Storms Over The Urban Forest

Second Edition 1994

Lisa L. Burban and John W. Andresen

**Planning, Responding, and Regreening--
A community Guide to Natural Disaster Relief**



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Cooperators:

USDA Forest Service, Northeastern Area

USDA Forest Service, Southern Region

University of Illinois, Department of Forestry

Illinois Department of Conservation, Division of Forest Resources

Florida Department of Agriculture and Consumer Services, Division of Forestry



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Storms Over The Urban Forest

Second Edition 1994

Planning, Responding, and Regreening- A Community Guide to Natural Disaster Relief

This handbook is for use by municipal leaders, public works directors, urban forest managers, and state urban forestry coordinators. It provides a ready reference of up-to-date procedures in planning for and responding to natural disasters. It leads the way in regreening the community.

By:

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Cooperators:

USDA Forest Service, Northeastern Area
USDA Forest Service, Southern Region
University of Illinois, Department of Forestry
Illinois Department of Conservation, Division of
Forest Resources
Florida Department of Agriculture and Consumer
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Forward

When a disaster such as a wind or ice storm strikes a municipality, it causes the people and government officials to take actions to ensure survival and safety of its citizens. Downed trees, power lines and wrecked property are major hindrances in getting help to injured people. The beautiful shade tree, now severely damaged, is a hazard that has to be removed in a hurry to get emergency vehicles through the city.

Only after several days and weeks of clean up does the impact of the damage and loss of trees become a stark reality. The urban forest we all had taken for granted is mostly gone or severely damaged. A lot of time and money has been spent on these trees just to clean them up. The few trees that remain have been cut and topped so they look like telephone poles with stubs sticking out, with little hope of their recovery. This is when people start looking at the loss of their urban forest and all of its benefits that they had enjoyed. Sadly, it is almost too late to help the situation. It would have been better to have taken action to protect these trees before the storm, including an action plan for treatment of these trees if a disaster does take place.

In a community that does not have a tree board or park department to direct the management of city trees, its movement to correct the situation may be slow and unorganized. If a good forestry program had been in place before the storm, fewer mistakes in storm damage clean up and damaged tree care would have occurred. There could have been fewer hazards, not only from violent weather events, but also from weak over-mature trees, which are those most subject to windfall and breakage. Emergency crews of tree trimmers and removers would have had clear directions on how to get the work done without causing added damage to the trees. Also, a contingency policy and funds for replanting would have been available.

State and Federal Emergency Management Agencies stand ready to help in a disaster situation; however, they are not prepared to direct proper tree care for the community. Each city has to take this responsibility. *Storms Over the Urban Forest* is the handbook to help communities plan, respond and regreen their town besieged by a natural disaster.

Gerald L. Jensen
Division of Forestry
Minnesota Department of
Natural Resources

Preface

Every year, across the country, we experience natural disasters such as floods, tornadoes, ice storms and hurricanes. 1993 was a particularly devastating year due to an almost continuous string of natural disasters. Some of the larger disasters included a record breaking snow storm on the east coast early in the year, unprecedented summer flooding in the Midwest, and fall fires in the foothills of southern California.

Many community's ability to respond to these disasters was hampered by the lack of prior planning. Through prior planning many of these communities could have reduced the severity of these disasters and improved their response and recovery processes.

In 1990, the Illinois Division of Forest Resources became involved in the replanting and greening of communities in northeastern Illinois damaged by a series of tornados. During this "tornado releaf" process, it became clear that the communities lacked a single source of information that would have enabled them to both develop and implement disaster action plans. This need led to the development of Storms Over The Urban Forest.

The first edition of Storms Over The Urban Forest was the result of a cooperative effort between the Illinois Department of Conservation, United States Forest Service, University of Illinois, and "Plant Illinois-A Growing Concern." This second edition brings in two additional cooperators, United States Forest Service and the Florida Department of Agriculture and Consumer Services. The manual provides communities with information that can be used to plan for natural disasters before the fact and mitigate the resulting damage.

A limited number of copies of this manual were printed. Permission is granted to copy any or all portions of this manual. Communities across this nation will benefit from the information included in this manual. I would hope that you would share the information it contains with other community leaders.

Stewart Pequignot, Chief
Division of Forest Resources
Illinois Department of Conservation

On November 8, 1990, a group of concerned citizens, local civic leaders, and

representatives of state and federal agencies met at Indian Trail Junior High School in Plainfield, Illinois to determine the best course of action to help area communities recover from the devastating tornado of August 28, 1990. This violent windstorm and tornado raged along a 16.4 mile path through Kane, Kendall, and Will Counties, causing over \$200 million in damage. Twenty-nine people lost their lives and four thousand trees were destroyed. Seven communities and surrounding areas were impacted, with Plainfield bearing the brunt of the tornado.

As a result of the public meeting at Indian Trail School, Operation Tornado ReLeaf was conceived. Four urban forestry oriented objectives were proposed:

1. Create a guide which can be used by municipalities to plan for woody vegetation recovery resulting from wind, snow, ice and other damage.
2. Create immediate and long-term programs to replant trees lost as a result of the August 28th tornado.
3. Assist elected officials and residents in forecasting the area devastated by the tornado.
4. Prepare individuals and municipalities affected and impacted by the tornado, for certification as Tree City USA communities in 1992 and 1993.

By the end of 1993, all four objectives were realized. Objective 1 led to the composition of the Storms Over the Urban Forest (SOTUF) natural disaster mitigation manual. Meg Bushnell, author of SOTUF's Chapter 7, describes a case study of the area impacted by the August 28, 1990 tornado, and efforts to releaf the area by the private sector. This Chapter also shows the response to Objective 2 and Objective 3. Illinois Division of Forest Resources District Forester, Tom Gargrave, accomplished Objective 4. Joliet, Oswego, Plainfield and Plano, were certified as Tree City USA communities in 1992 and 1993. Joliet also achieved a Tree City USA Growth Award in 1992.

As public official during the time, I need to acknowledge the enormous efforts of Meg Bushnell, Tom Gargrave, John Andresen, and Lisa Burban for their help and encouragement. Without their sustained support, the "releafing" of the communities would have taken much longer and would have been a more painful process.

As further reinforcement of Operation Tornado ReLeaf's primary goal to aid northeastern Illinois cities and villages to re-establish natural disaster-ravaged urban forests, the University of Illinois Department of Forestry developed a series of eight planning reports in January of 1992. These reports were concerned with factors and methodology which influenced the recovery of urban forest vegetation

following a natural disaster. All of the tornado impacted communities, including Plainfield, were studied.

In support of Tom Gargrave's Tree City USA success, and in recognition of multiple urban forestry benefits, including the recovery of trees from natural disasters, I strongly advocate that all municipalities seek certification credentials provided by the National Arbor Day Foundation, sponsor of the Tree City USA program. If communities do not qualify at this time, they should contact their local district forester for assistance.

Mary T. Latta
Former Village President
Village of Plainfield, Illinois

Executive Summary

Natural disasters which can occur in the United States include floods, hurricanes, tornadoes, and related high-velocity winds, as well as ice storms. Preparing for these natural disasters, which strike urban forests in large cities and small communities, should involve the cooperative effort of a wide array of municipal agencies, private arboricultural companies, utilities, and volunteers. Principles and methods determining how to mitigate or minimize the impact of natural disasters are critical in determining the capability of communities to respond. Similarly, replanting the uprooted urban forest also requires a closely coordinated effort of key civic leaders, elected officials, community foresters, and managers of municipal agencies. This manual is intended to assist community leaders and governmental agencies to prepare for natural disasters, respond appropriately when these natural disasters occur, and recover from the subsequent loss of vegetation.

For urban foresters, mitigation involves efforts to prevent or minimize damage or loss of trees in areas affected by natural disasters. The three chronological emergency action phases for natural disasters involve:

- Preparation--planning and warning activities
- Response--immediate activity during and after natural disasters
- Recovery--activities to regain or improve upon pre-disaster conditions

A flexible action plan must be created as part of the preparation for natural

disasters. This plan is a critical step. Many activities can be accomplished prior to a natural disaster. These can reduce the severity of its impact. Technical and practical training helps prepare professionals and lay persons for rapid and efficient mobilization. Communities must recognize that disaster damage often exceeds what can be handled by municipal workers. Thus, a list of private and public cooperators should be developed and kept up-to-date. One of the most important preparation activities is the proper planting and maintenance of the urban forest. If trees are planted improperly, or in the wrong site, and if trees are not given adequate care, they may sustain greater damage than trees that are properly planted and cared for.

Identification of an effective early warning system for natural disasters is essential. Three to five hours of lead time before severe weather strikes can be gained using information from the National Weather Service, consulting meteorological firms, TV weather channels, or local municipal police departments.

Small-sized communities differ from medium- to large-sized communities in that they usually do not administer a public works department or municipal tree program. Unfortunately, for many small communities, natural disasters may often be poorly managed for lack of planning and preparation. Fortunately for these communities, assistance is often available through expert tree services, utility companies, and other communities. Medium- and large-sized communities usually have a public works department, but may or may not have a municipal tree program. Two examples of mitigation plans, one for medium-sized communities and one for large-sized communities, are presented in detail in this publication.

After a natural disaster has occurred, a variety of community replanting or greening opportunities exist. Key players to greening include: volunteers, community leaders, elected officials, as well as extension service experts, urban foresters, state and local natural resource professionals, consulting foresters, private tree care firms, and state and national professional organizations. It is critical that greening efforts focus on planting the right tree in the right location.

National awards such as Tree City USA and the Tree City Growth Award encourage communities to manage their urban forest to maintain its health, beauty and safety. State and local awards are often also available. Recognition at all levels (national, state, and local) for the community and its citizens is an essential element to maintaining urban forestry interest and support.

When working with state and federal disaster relief organizations, local officials must understand the response and recovery process. Initial activities are emphasized at the local level. If additional assistance is needed, local authorities

will contact State Emergency Management Agency (SEMA) officials to have the impacted area declared as a disaster. If necessary, SEMA officials may contact Federal Emergency Management Agency (FEMA) officials for federal disaster declaration. For communities seeking financial assistance for tree-related costs, it is critical that these communities show a commitment to managing their tree resources. Also vital, is a tree inventory that includes statistics on tree values.

A case study of the August 1990 tornado that struck several northeastern Illinois communities discusses initial response activities, including the development of a Tornado ReLeaf organization, public education opportunities, fund raising, and assistance activities. The effort to regreen these communities was a public and private partnership. As such, regreening activities were completed on public right-of-ways, as well as on private lands.

Insights from Hurricane Andrew illustrate how devastating a natural disaster can be to a highly urbanized area. Much of the hurricane related damage, unfortunately, was the result of poorly located trees, poor species selection and improper maintenance.

The final two chapters of this mitigation document focus on technical resources and sources for additional information and assistance. Mitigation resources include technical references, volunteer resources, natural resources organizations (public and private), a literature review, a bibliography, a literature cited section, and a number of relevant documents.

Acknowledgments

Communal cooperation throughout the Northeastern United States provided a wealth of support to generate this natural disaster mitigation manual. At the federal level, Area Director Michael T. Rains of the USDA Forest Service, Northeastern Area, State and Private Forestry, was instrumental in recommending the preparation of our initial "Managing the urban forest to mitigate natural disasters." Retired Illinois State Forester Allan S. Mickelson provided continual encouragement and fiscal support from start to finish. And at the University of Illinois, Dr. Gary L. Rolfe, Head of the Department of Forestry, and his Administrative Aide, Joyce Canaday, coordinated and managed the project. Dr. Patrick Weicherding, Extension Specialist, Urban and Community Forestry, provided valuable editorial assistance.

Chapter 7 of this manual, "Tornado ReLeaf--A Case Study," was written by Mary B. Bushnell, Assistant to the Director, Illinois Department of Conservation. This chapter provided a case study describing the role of not-for-profit organizations. Dr. Reinee Hildebrandt, Urban Conservation Programs Administrator for the Illinois Department of Conservation, provided a number of manuscript enhancements. District Forester Tom Gargrave, also of the Department of Conservation, deserves the credit for the original thoughts of the Operation Tornado ReLeaf concept which led to this mitigation manual. Our sincere thanks go to Ken Ottman and his able staff, as well as Mike Stankovich, who shared their disaster plans for use as models in our manual.

Chapter 8 of this manual, "*Notes from Hurricane Andrew*," was written by Gene Dempsey, Senior Forester with the Florida Department of Agriculture and Consumer Services. We sincerely appreciate Gene's assistance with the writing and editing of the Second Edition and his contributions of the many excellent photographs throughout the document.

Evolution of the mitigation manual from the local municipal level to the regional plateau began with the inspiration of Plainfield, Illinois' Mayor, Mary T. Latta. Also at this fundamental level, Plainfield Township Supervisor Doug Almon supplied field office space and secretarial services. Additionally acknowledged is the cooperation extended by the many community mayors and village presidents, as well as forest and park district supervisors, who had experienced natural disasters.

The Second Edition of Storms Over the Urban Forest was made possible through cooperative support from the USDA Forest Service's Northeastern Area and Southern Region. We wish to especially acknowledge and thank Ed Made of the Southern Region for his advice and support throughout the revision process.

We appreciate the courtesy of Dr. Walter A. Robinson, Associate Professor of Meteorology at the University of Illinois, for providing us with the cover's photographs. We also wish to thank the National Oceanic and Atmospheric Administration and the National Weather Service for the many photographs used throughout the document.

The following authors and organizations graciously permitted us to include their papers and publications as appendix material: The National Arbor Day Foundation; American Forests; the National Arborist Association; the International Society of Arboriculture; the Minnesota Shade Tree Advisory Committee, Community Outreach Task Force; and the USDA Forest Service; Northeastern Area,

Without the word processing skills of Mrs. Lorene Bier, hundreds of pages of hand-scribbled notes would still be in rough form. Funding for the field studies and publication of this mitigation manual were provided by the USDA Forest Service, Northeastern Area, State and Private Forestry; the Illinois Department of Conservation, Division of Forest Resources; the Illinois Agricultural Experiment Station's project 10-664; and the University of Illinois, Department of Forestry.

A very special thank you to the efforts of Kathy Anderson, Program Assistant with the USDA Forest Service's Northeastern Area St. Paul Field Office. Kathy's tremendous support, innovative ideas, and constant enthusiasm allowed us to reach the light at the end of the tunnel in producing our Second Edition.

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Chapter 1

Introduction

Following a severe August, 1990, tornado that struck Kane, Kendall, and Will Counties in Illinois, a consortium of concerned federal, state and university agencies decided to prepare a disaster mitigation handbook to serve the 20 states of the Northeastern Area. This second edition of Storms over the Urban Forest has been expanded to serve the needs of all 50 states. Emphasizing practicality, this manual is intended first, to assist community governmental agencies to prepare for natural disasters and second, to recover from the subsequent loss of vegetation. Throughout the document, the use of proper tree maintenance and tree planting techniques are emphasized.

Throughout the world, violent weather is a constant companion to the other natural and social disasters which strike the global inhabitants (Anon. 1985):

- Nearly 2,000 thunderstorms are in progress at any moment.
- 45,000 thunderstorms and related phenomena occur daily.
- Annually, 16 million violent storms bombard the land surface.
- Lightening strikes the earth 100 times each second.

In the United States, from 1959 to 1984, the violent children of mother storm clouds generated these statistics:

- Every year, at least 100,000 thunderstorms rumble across the sky.
- On an annual basis, 100 people are killed and 250 are severely injured.
- Most of the death and destruction of people and urban vegetation occurs in the eastern half of the nation.

Table 1. Social costs, including urban tree losses, in America resulting from violent weather during the concentrated period of 1970 to 1976 (on an annual basis) (Kessler, 1983)

Event	Human Deaths	Property Damage \$Million
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Tornado	125	300
Lightning	110	200
Hail	less than five	750
Thunderstrom flood	165	100*

*Damage from all floods was about \$1 Billion.

One final set of statistics, relating to hurricanes, involves the phenomenon of "storm surge." Storm surge refers to a rapid rise of sea level that occurs as a hurricane approaches a coastline. In 1990, 6,000 deaths plagued Galveston, Texas. Hurricane Audrey, in 1957, developed a storm surge which killed 390 in Louisiana. Thousands of coastal, urban trees were devastated. And in 1928 the flood waters of Lake Okeechobee, driven by hurricane winds, caused 1,836 human deaths (Pielke 1990).

More than 80% of the population of the United States lives in cities and communities, and this percentage continues to increase. Recently, because of the heightened public interest in the environment, people began placing a greater emphasis on having a healthy urban forest. Current interest in urban forestry is capitalizing on the public awareness of the value of trees to ameliorate our otherwise rather bleak urban landscapes. People understand the need for long-term care of urban forests. Because of the often severe impact of natural disasters on the urban forest, people are supportive of management activities which help ensure that natural disaster damage is minimized. They also accept the concept that it is necessary to replace trees destroyed by natural disasters.

To compound the problems associated with natural disaster damage, two new components further challenge urban forest management: 1) increasing property values (enhanced by the value of trees), and 2) ever sprawling urban areas, which make regreening more extensive in the aftermath of violent weather.

A number of organizations, public and private, are concerned with vegetation damage mitigation. The USDA Forest Service, state natural resource agencies, the Federal Emergency Management Agency (FEMA), and State Emergency Management Agency (SEMA), often work together with other agencies and organizations during natural disasters. State Foresters can provide necessary mitigation information during and following a storm using information and services of various newspaper and television media. Nonprofit institutions such as the National Arbor Day Foundation (NADF), American Forests (AF), and the

International Society of Arboriculture (ISA) now sponsor a variety of educational programs which relate directly to urban forest disaster mitigation. NADF edits and distributes a series of Tree City USA Bulletins with relevant topics such as "When a Storm Strikes," "How to Hire an Arborist," and "How to Select and Plant a Tree." AF publishes the bimonthly magazine "Urban Forests." Relevant subjects in issues included "Global ReLeaf," "Hurricane Hugo ReLeaf," and "Planting New Life in The City." ISA publishes the "journal of Arboriculture," "Arborists News," and "ISA Today." Relevant articles in these include; "England Before and After the Hurricane of 1987," "Hurricane Hugo Damage," "Photo Guide to Hazard Tree Recognition," and "Wounds on Trees."

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Chapter 2

Coping With Natural Disasters

2.1 Chapter Summary

Mitigation activities work to eliminate or reduce the occurrence of future disasters. From an urban forestry perspective, mitigation activities are efforts to prevent or minimize damage or loss of trees affected by natural disasters.

Natural disaster activities consist of three chronological phases: preparation, response and recovery. Morentz *et al.* (1982) has identified eleven mitigation categories that are key to those involved in natural disasters. These categories are: management, public participation, rules, economics, monitoring, planning, research, structural, assessment, influence, and professional training.

2.2 Chapter Outline

- I. Mitigation Defined
- II. Mitigation Action Categories
 - A. Management
 - B. Public Participation
 - C. Rules
 - D. Economics
 - E. Monitoring
 - F. Planning
 - G. Research
 - H. Structural
 - I. Assessment
 - J. Influence
 - K. Professional Training
- III. For More Information

2.3 Mitigation Defined

The term "mitigation" refers to "activities which eliminate or reduce the occurrence of future disasters." Mitigation consists of efforts undertaken in an orderly and planned fashion to accomplish the long-term preventive avoidance of the impacts of hazards on society (Morentz *et al.* 1982). Mitigation can be interpreted by an urban forester as efforts to prevent or minimize damage or loss of trees affected by natural disasters. Examples of mitigation activities related to urban forestry include: removal of hazardous trees; pruning trees properly to maintain health and structural integrity; planting trees appropriate to a communities' hardiness zone; and minimizing damage to the roots during construction activities.

2.4 Mitigation Categories

Emergency action for a natural disaster consists of three chronological phases:

1. **Preparation**--disaster planning and warning activities. Examples of activities include: the identification of an early warning system for severe weather, development of a disaster response plan, identification of roles of various individuals and municipal departments during disasters, and identification of groups or communities to contact for additional assistance when necessary.
2. **Response**--immediate activity during and after the disaster. Examples of activities include: tree damage clean up, clearance, identification of methods of communication from the field to the office, determination of debris disposal options, and use of efficient record-keeping methods.
3. **Recovery**--activities after the disaster that attempt to restore conditions prior to the disaster. Examples of activities include: public and private tree planting and care, training, tree planting awareness events and celebrations, and recognition activities for volunteers, citizens, municipal workers, and others involved.

Eleven mitigation action categories have been identified that relate to natural disasters (Morentz *et al.* 1982). All categories would be of use to municipal leaders and others involved in natural disasters. These eleven categories link directly to the three emergency action phases and are listed below by importance:

Mitigation Action Categories

Management

Public Participation
Rules
Economics
Monitoring
Planning
Research
Structural
Assessment
Influence
Professional Training

A. Management

In practice, management includes sound administration of people and resources as well as coordination and liaison between government agencies, the public and the private sector. Strong management begins at the lowest possible grass-roots level. This approach tends to generate continuing and wise management as the mitigation process ascends through higher levels.

1. Good management means a smooth flow of essential communication and efficient alignment of personnel and other resources. Total chaos can and will occur during and after a natural disaster. Downed telephone lines, loss of electricity, and a sudden influx of people and agencies wanting to provide assistance all add to the confusion. Local people who have knowledge of the area impacted should be available to help coordinate activities and keep the lines of communication open.
2. A management style that incorporates open communication and flexibility can achieve a close working relationship among all agencies. It also allows close coordination, information and resource sharing (equipment, personnel, money and technology) in an unrestrained, facilitative environment. Management styles may vary among different agencies and organizations involved. For example, law enforcement officials and the military have a very structured, authoritative style which may lead to conflicts in how decisions are made. These problems should be recognized and anticipated, if possible.
3. Management should be located at the lowest feasible level, closest to the hazard problem. Key decision makers should be identified before any disaster ever occurs. These individuals are critical in obtaining approval and initiating efforts.
4. A committee of local residents should be established to serve as "user representatives" and as a helpful sounding board for project management. Public needs and concerns should be recognized. Organized civic groups such as tree boards should be involved, rather than establishing new

groups.

5. Public participation opportunities, such as town meetings, should be available to allow citizens to participate in planning and recovery efforts.
6. Mitigation efforts must be based on local and regional guidelines, and must be consistently stated in guidelines produced at all levels.
7. A key to guaranteeing sufficient public involvement and support is media cooperation and publicity. It is very important to keep the public up-to-date on activities, new initiatives, advancement, and successes--utilize the media to accomplish this.
8. Preplanning efforts should involve continually updating technical information and identification of technical resource people that can be called upon to provide advice and information. This information must be assembled and available when the disaster strikes. During the response phase, this information must be easily obtained--there won't be time available to search and develop information.

B. Public Participation

At par with management, public participation enhanced by public information programs is essential to the mitigation process. At the user or consumer level, both the array of government levels as well as the private natural resource sector, should use public information campaigns. These should be geared to timely, consumer oriented urban forest enhancement and rehabilitation topics.

1. Public information and education campaigns promoted by the government or interest groups tend to result in consistent support of mitigation because the message to the public is directed and controlled by these recognized agencies.
2. Timing of public information and education programs is important. Have public service announcements written in advance. Programs are most effective immediately after the occurrence of a hazardous event, but in addition, frequent messages about the benefits of disaster planning are influential.
3. Information and educational programs need to assess current levels of information held by the public in order to design the proper technique for communicating mitigation messages.
4. Inconsistency in media reporting on mitigation have led mitigators to develop carefully considered media contacts and working relationships with them. This helps prevent misleading or sensational media coverage.
5. The issue of credibility stems from the need to keep the confidence of the public with well-executed public information and education efforts.
6. Credibility is enhanced by using communication methods which provide

direct contact with the public. Simple messages are more understandable and are received as more credible.

7. Public information may, in itself, become a primary instrument for disaster mitigation.

C. Rules

Cohesion of mitigation opportunities is assured through rules and regulations. In dealing with government agencies, rules are a part of the process that must be accepted and understood. Government laws and measures including codes, ordinances and statutes, as well as non-government agreements and covenants, are components of the rules dimension. Also, legislation, as well as litigation, enforce or support mitigation.

1. Rules contain the philosophy, goals and criteria of disaster mitigation. All of these must be understandable to the public in order to promote citizen participation.
2. Mitigation rules minimize interpretation and contain all administrative procedures for regulation. This includes roles, exceptions and applications.
3. As experience is gained with mitigation rules and as research presents new knowledge, mitigation directions can be updated. This process is expedited if rules are designed in two parts. The first part is the rule itself. The second part details acceptable standards of performance. Rule changes require governing body approval: standard changes can be done administratively.
4. Among the most important rules are building codes, land use plans, zoning ordinances, and for this discussion--a city or county tree ordinance. A tree ordinance is critical. Therefore, if a community does not have a tree ordinance, one should be adopted.
5. State mitigation agencies are well designed for hazards with statewide, county-wide, and even local implications.
6. Agencies at the state government level have a wide perspective to develop model ordinances which local governments may use to mitigate disasters.
7. In addition to possible incentives for local mitigation, some states require these activities through their community development and planning legislation.
8. At the state level, State Emergency Management Agency (SEMA) offices are available to assist local communities after a natural disaster.
9. The Federal Management Agency (FEMA) provides technical standards, guidelines and fiscal assistance relating to federally declared emergencies or natural disasters. FEMA's recognition and support of trees and urban forest management activities continues to evolve and expand.
10. Finally, some states also help local municipalities to mitigate disasters by

centralizing the administration of federal assistance programs in a state office.

D. Economics

Without sound and well thought out economic planning, many mitigation opportunities are wasted. Financial rewards, adequate funding and related fund raising campaigns to gain hard dollars, in-kind services, and matching grants are necessary to meet mitigation goals and objectives. Response and recovery to a natural disaster can strain a community's financial resources. Additional funds for these activities may be available from FEMA, SEMA, federal, state, county or local government, civic and volunteer organizations, and professional organizations. (Refer to Appendix B, How to Fund Community *Forestry*" in Chapter 5 for additional funding recommendations.)

1. Fundraising is a worthwhile endeavor that requires a thoughtful and professional approach if it is to be successful.
2. Public funding does not usually cover efforts involving tree replacement, pruning and removal on private property.
3. Both community activities and media support are essential to the success for fund raising.
4. Local funds are available in municipal, township and county general funds if there is sufficient lead time to create a tax or bond base for mitigation activities. Other sources for local fund raising are grants-in-aid, tax levies and foundation grants.
5. The receipt of public funding may not be immediate. Therefore, communities may wish to seek funding from private sources for more immediate efforts and needs.
6. Forming a local group of agencies can lead to consortium funding, special solicitations and appeals for assistance.
7. States which seem willing to take sole responsibility for financing mitigation do so primarily for remedial measures. Long-range preventive solutions are often left for more complex financial arrangements. Therefore, communities at the local level must recognize the financial commitment involved to plant and manage municipal trees.
8. States often provide a variety of financial assistance including low-interest loans for partial financing of mitigation projects. State government can also help to fund projects which are not eligible for federal assistance.
9. Most state and private grants require a cost-share or funding match in the form of cash or in-kind services.
10. Government and private enterprise may have numerous formulas for cost sharing.

E. Monitoring

Mitigation is often confounded by conflicts of interest. Monitoring reduces these conflicts by providing compliance, enforcement and inspection methodologies. Monitoring also requires the coordination and goodwill among all agencies and organizations involved in the mitigation process.

1. Local agencies have the responsibility to monitor localized events such as floodplain inundation from a single site or land use controls in a valley. However, they frequently lack the technical expertise to detect new or unexpected hazards.
2. State agencies monitor events which have potentially broad state impact, but sometimes fail to recognize that hazards extend across neighboring states.
3. Federal agencies monitor hazards with regional impact and those involving the national interest. Federal monitoring experience is inconsistent from a local vantage point since techniques for monitoring differ.
4. Whatever the level of enforcement, monitoring requires coordination among numerous agencies and organizations.
5. When different levels of government have similar goals, they can share resources. Such sharing of resources and responsibilities can lead to improved efficiency and intergovernmental rapport.
6. New missions and goals are sometimes established by one level of government and are simply relayed to another unit without new resources, personnel, or funds for implementation. This creates intergovernmental tensions and unenforceable rules.
7. It is common for more than one level of government to have corresponding laws and regulations, largely because of the initiative of federal rule makers. Gaps exist in coordinating federal rule-making with that of state and local government.
8. The public has a role in the enforcement of all hazard rules, because the rules are a definition of the risks the community is willing to take.
9. In order to have intelligent public cooperation, it is necessary for the rules to be clearly understood and the hazard sufficiently visible, to detect violation of the rules.
10. Public knowledge and concern can provide significant pressure to force compliance by violators and insure enforcement by authorities.
11. If the public is well informed of hazard rules, they can monitor compliance and, in limited cases, enforce rules.

F. Planning

According to Morentz et al. (1982), "Planning is a process of anticipating future needs and programming resource expenditures in light of expected hazardous conditions and human vulnerabilities."

1. A wide range of agencies, individuals, users, and affected parties is involved in planning.
2. A core group is needed to sort out the diverse interests in planning outcomes. This may be a government agency, quasi-public organization or private group. Members of a core group for an urban forestry mitigation plan may include representatives from the Forestry Department, Department of Public Works, Parks Department, Police and Fire Departments, utility companies, local arboricultural firms, neighboring communities, media, nurseries, a climatological consulting firm, or local civic groups.
3. Planning helps participants to agree on goals, assumptions, purposes, and resources.
4. Planning must be coordinated with all levels of government.
5. Mitigation planning must be coordinated with other types of plans (for example, the plans used by the fire or police departments or utility company).
6. Approval of the final plan, by all participants, allows administrative responsibility to be assigned.
7. A good plan has four major characteristics: local relevance, public participation, technical information, and cyclical monitoring evaluation.
8. Technical quality and clarity are essential to the plan.
9. Ratification of the plan can be built into the planning process itself.
10. Review and updating procedures of the plan are required. Annually review contact names and telephone numbers.
11. The public media are key to gaining and maintaining public interest, involvement and support of the disaster mitigation planning effort.
12. Thoughtful planning should help counter the crises-seeking attitude of the media. Planners must anticipate this conflict. They must strongly encourage the media to use properly phrased information and demand that the media be responsive to the entire planning process.

G. Research

Both basic and applied (practical) research is of interest to three major groups: 1. legislators; 2. mitigation planners; and, 3. opponents to mitigation, who seek support of their opinions. On the whole, research provides an endorsement for positive mitigation options.

1. Research involves scientific investigations into the prevention or mitigation of disasters and the cause of hazards. It includes applied research or demonstrations which illustrate the feasibility of implementing new techniques or findings on mitigation.
2. The mitigation manager should create a "user group" to advise on appropriate aspects of research. A user group should be concerned with user research needs and variations for affected parties. They should not be concerned in research designs or other technical content.
3. The manager should develop public information and education advisory groups, to enhance dissemination opportunities and to improve the use of research findings.
4. The manager should obtain commitments from government that research results will be given full consideration.
5. The manager should keep interested groups involved throughout the research project.
6. A fundamental dilemma exists between basic mitigation research and its application, due to the **difficulty in distinguishing one from the other**. This dilemma is reflected in the continuing frustration of mitigation practitioners with mitigation research.
7. Effective mitigation requires that researchers and users work together to resolve these tensions.

H. Structural

Structural mitigation solutions encompass actual engineering and mechanical devices or methodologies which enhance mitigation. Examples include anti-hurricane structures, avalanche control, community protective tornado shelters, flood diversion measures, more reliable siren warning systems, prescribed burning of forests to reduce combustible matter, seeding thunderstorm clouds with silver iodide crystals, stream bank stabilization, and windbreak restoration.

I. Assessment

Numerous bits of essential data are available but need to be collected, sometimes processed, and often interpreted to solve the majority of assessment needs.

Potential assessment questions to be asked include:

- Which mitigation measures provide the best cost-benefit ratio?
- Where is it safe to develop new homes and communities?
- What remedial measures are required?
- How effective would the mitigation strategy be?

In addition, assessments require many considerations which make the process an expensive proposition.

J. Influence

Lobbying for influence is a fact of life in the mitigation scenario. Further, electoral activities promoting candidates, issues or actions are common to mitigation efforts. Referenda, which the voting public endorses, can enhance or negate mitigation practices.

1. In order to compete successfully with well funded industry interests, mitigation issues must be translated into clear statements of benefit compared to hazard risks.
2. The public, in both behind-the-scenes lobbying and more up-front politics, often is in competition with industry for the attentions of elected officials.
3. Timing is critical; events and attention are allies of influence.
4. Credibility must be established. Solid technical facts are influential.
5. Professionalism is the key to a team approach for a quality mitigation product.
6. Build in a role for the media. If political or other sensitive issues develop, established media contacts are useful.

K. Professional Training

Professional training incorporates technical instruction to enhance the skills of workers, managers and administrators concerned with natural disaster mitigation. Professional training involves the transfer of information and technology included within all of the previous ten mitigation categories. In essence, professional training is the keystone which supports the arch of successful mitigation.

1. Training can be viewed as a two-step process; technical information is exchanged with a group of technical experts (architects, building inspectors, city planners, engineers, science editors, and urban foresters) which is responsible for the formulation of standards of performance, conduct and knowledge. This group then filters less technical information to a second group (builders, contractors, educated public, elected municipal leaders, and teachers) which is involved in implementing the standards or policies which concern them.
2. Media possibilities are extensive, but need to be appropriate for both the content and the audience of mitigation training.
3. Content for mitigation technical training is extremely varied and must be adapted to each of the identified primary audiences.

4. There is a training role for the private sector, especially in the mitigation of man-made disasters as well as for natural disasters.
5. Local emergency personnel, such as local police or fire and utility representatives, should train local volunteers.
6. State officials should train local officials and private-sector emergency personnel.
7. The federal government and pertinent national professional organizations are excellent sources for training materials for national mitigation programs.

2.5 For More Information

Contact the local state forestry office, regional FEMA office, or state offices responsible for disaster operations. Addresses and telephone numbers are listed in Chapter 9, Sections 9.5, 9.6, and 9.7.

Federal Emergency Management Agency. 1990. *Disaster assistance programs: A guide to Federal aid in natural disasters*. Federal Emergency Management Agency. Washington, D.C. 20472.

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Chapter 3

Preparing for Natural Disasters

3.1 Chapter Summary

Since management activities of natural disaster planning must anticipate everything from direct encounters with disaster and damage to mediating strong public reactions, a brief summary of the previous planning observations are provided to begin the discussion. Miller (1988) suggests that contingency plans must exist to manage storm damage, provide for rapid restoration of utility services, clear debris from streets, remove hazards, and to repair other essential services. He advocates that well trained crews need to be available for rapid mobilization. Further, contingency funds should be budgeted for overtime pay.

If the disaster damage is greater than the municipal workers can handle, a list of cooperating private contractors or other neighboring collaborating communities or cities should be cataloged to assist in storm damage clean up. Telephone numbers plus related agency names, administrators of higher levels of government and volunteer organizations should be available. These authorities stand ready to assist communities with catastrophic damage control and recovery measures.

3.2 Chapter Outline

- I. Planning
 - A. Types of Plans
 - B. Planning Keys to Success
- II. Training
 - A. Potential Training Categories
- III. Planting Tips
- IV. Planning Tips
- V. Examples of Activities for Trained Volunteers
- VI. For More Information / References
 - A. Appendix---[The Right Tree for the Right Place](#)
 - B. Appendix---[How to Recognize - and Prevent - Hazard Trees](#)
 - C. Appendix---[Plan to Plan](#)
 - D. Appendix---[Handbook for Volunteer Tree Projects](#)

3.3 Planning

The planning process is essential for mitigation success, both before and after natural disasters. Natural disaster planning must be a dynamic and flexible process, due to the unpredictable nature of natural disasters. According to Morentz *et al.* (1982), "Planning is a process of anticipating future needs and programming resource expenditures in light of expected hazardous conditions and human vulnerabilities."

At the vegetation level, the homeowner or municipal tree manager must visualize trees as they grow and mature, and plan for the changes. To paraphrase Fazio (1988), "A few cents of preventative planning are worth many dollars of remedial arboriculture." Fazio advises several points for vegetation planting and maintenance, and these are presented along with recommendations from a number of arborists and urban foresters in the upcoming sections titled "Planting Tips," and "Planning Tips."

Several types of plans may be made that would be extremely useful in the event of a natural disaster. These plans are as follows:

- Natural Disaster Mitigation Plan - This plan would serve as the guiding document for managing the tree resource in a community before, during and after a storm. Plan could include
 - Tree care prior to a storm
 - Storm response and clean up
 - Rules and regulations regarding private property debris pick-up and disposal
 - Regreening and recovery
 - Saving and repairing damaged trees
- Arboricultural/Tree Care Expert Plan - This plan would serve as a guide for a private company in the event of a storm. Refer to article at end of chapter titled "Plan to Plan." Plan could include:
 - Equipment needs
 - Additional assistance (financial, staffing, other tree care firms)
- Comprehensive Urban Forestry/Master Street Tree Plan - This plan would serve as a community's guide to tree planting, maintenance and care.

A Community may wish to consider the following elements or "Keys to Success" as they plan for natural disasters:

- Have a core group of people that manage activities. Be sure members of this core group are empowered to make decisions. Include representatives from the following groups:
 - Police, Fire, and Public Works Department
 - Forestry Department
 - Private Arboricultural Firms
 - Media contacts
 - Climatological consultant
 - Utility company(s)
 - Nurseries
- Coordinate the tree-related mitigation plan with any other mitigation plans in the community (fire, police, utility).
- Assign administrative responsibility to plan actions to assure that nothing is overlooked and that someone has the authority to accomplish the necessary tasks.
- Review and update the plan annually.

- Provide adequate training to all possible players.

Communities have differing needs and resources. Depending on the size of the community, the budget, staff, etc., communities will vary in their ability to plan for and respond to natural disasters. These factors must be considered. If a community has very limited financial resources for urban forestry, it may be more beneficial for them to develop a less detailed comprehensive urban forestry plan, and target their limited funding towards removal or pruning of hazardous trees.

3.4 Training

In Section 2.4 of this document, which discusses mitigation categories, the topic of professional training was presented in terms of options for training. To emphasize this concept, training can be technical or quite practical, depending on the audience. Morentz *et al.* (1982) note that highly technical training is appropriate for the "knowers," while more practical training is appropriate for the "doers." Knowers are the individuals that train the people who will be doing the training. Doers are the trainees. Oftentimes these doers are volunteers. Working with volunteers requires an understanding of their motivations, limitations and needs. Excellent resources for information on working with volunteers and sources of volunteers are provided at the end of this chapter and in Chapter 8 of this manual. The following prescriptive activities should be noted when training occurs:

1. Plan carefully.
2. Base the training program on sound technology and research information.
3. Use adequate equipment.
4. Allow sufficient time for learning and set aside time for questions.
5. Use a variety of techniques; hands-on experience is extremely useful.
6. Use instructors (where possible) who have experienced what they are training.
7. Develop credibility with the trainees.

Continuing education is very important to keep staff and crews up to date with changes and new techniques in urban forestry management and mitigation technology. Training should not be considered a "one-time" experience, it should be continual. Potential training categories may include:

- Planting the right tree in the right place
- Choosing proper nursery stock
- General tree care and maintenance
- Proper tree planting techniques
- Tree pruning
- Storm clean up, and safety hazards when clearing debris

Of special note: All activities related to natural disasters must be planned ahead of time and practiced periodically so that everyone is ready to respond rapidly and effectively during the actual event.

3.5 Planting Tips

1. Large crowned trees should not be planted under or near utility wires, too close to buildings and other structures.

2. **Note: Most trees have the greatest percentage of their roots in the upper 18 inches of soil; therefore, it is critical that roots are not severed or cut, and that roots have enough room to grow and establish themselves and to anchor the tree.** (See Photographs 1 & 2.)



Photo 1. Inadequate amount of space available for root growth and anchoring.
(Florida Dept. of Ag. & Consumer Services)



Photo 2. Results of inadequate root space.
(Florida Dept. of Ag. & Consumer Services)

3. Select proper tree species based on site considerations. Refer to the publication at the end of this chapter titled, "The Right Tree for the Right Place." Contact your State Forestry Office for a list of recommended trees for your state or region. (Address and telephone numbers are listed in Chapter 9, Section 9.5 - State Forestry Offices.)

4. Avoid planting brittle species on sites where breakage will cause future problems.

Note: In certain environments, many of these "brittle" species may thrive (for example, in inner city areas). Rather than having an environment devoid of trees, it may be best to allow these somewhat less desirable species to remain -- unless they represent a potential hazard.

5. Select healthy, quality nursery stock for tree planting (refer to Diagram 1). Be sure to obtain trees that meet your state's Grades and Standards. This will reduce pruning requirements in the years following planting and help ensure that trees are healthy when they reach the planting site.

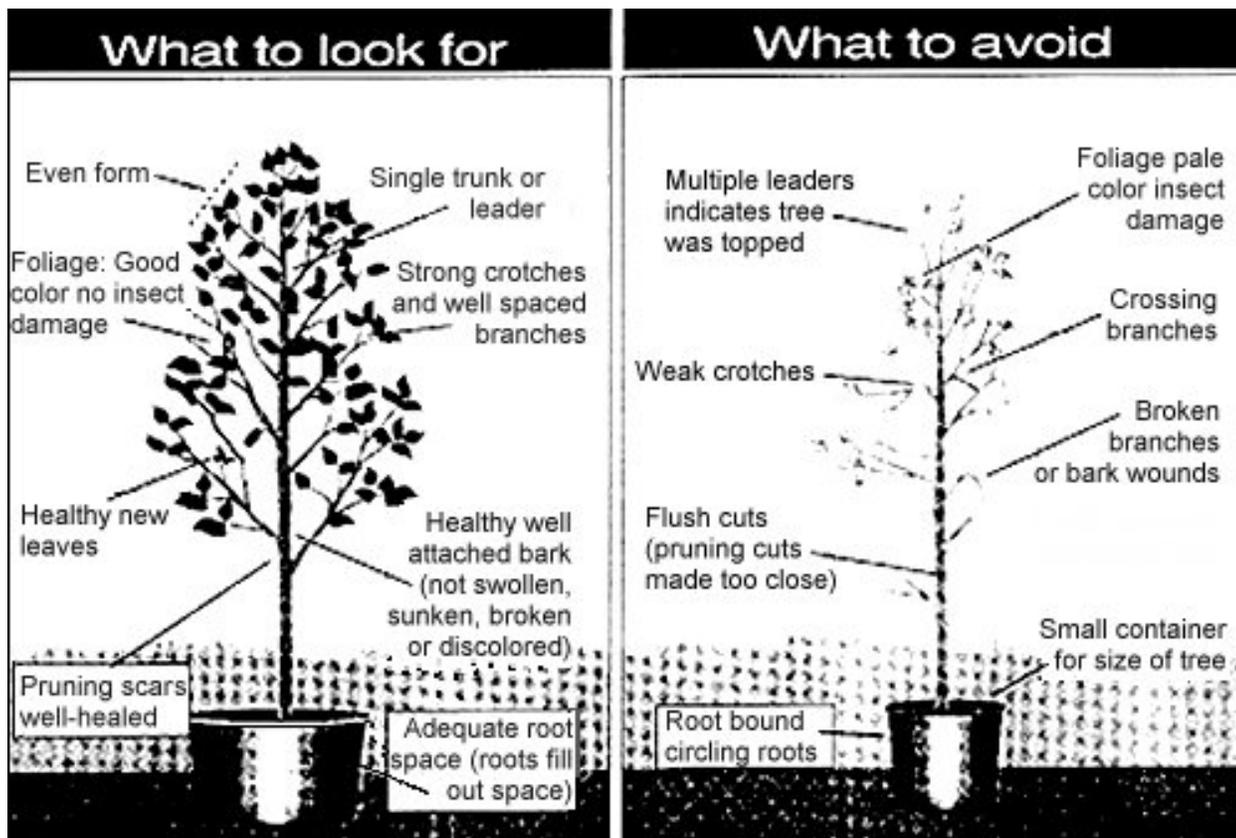


Diagram 1. Recommendations for choosing quality nursery stock.
(Florida Dept. of Ag. & Consumer Services)

6. Where autumnal ice storms are common, avoid planting species that retain their foliage late into the fall. These species can capture a greater weight of ice and are, therefore, more susceptible to breakage. The following species tend to keep their foliage until late in the fall (Harris, 1992):

- European white birch (*Betula pendula*)
- Sweetgum (*Liquidambar styraciflua*)
- Magnolia variety (*Magnolia x soulangiana*)
- Scarlet oak (*Quercus coccinea*)
- Pin oak (*Quercus palustris*)
- English oak (*Quercus robur*)
- Weeping willow (*Salix babylonica*)

7. Where spring ice storms are common, avoid planting species that leaf out early. Example of these species include (Harris, 1992):

- Boxelder (*Acer negundo*)
- Tulip poplar (*Liriodendron tulipifera*)
- European mountain ash (*Sorbus aucuparia*)
- Siberian elm (*Ulmus pumila*)

8. During driveway and sidewalk replacements or other excavation near trees, keep root damage to a minimum. It is best to avoid cutting roots. Sidewalks may need to be moved to give tree roots adequate room to grow.

Auguring under root systems when working with underground utilities is recommended.

9. Beginning when they are young, prune trees to prevent development of weak form. If possible, annually prune and shape newly planted trees to properly form for at least five years after planting

10. If possible, annually prune dead or weakened limbs. if the tree has structural problems, it may be necessary to periodically thin excess branch wood from the crown. **The goal is to produce a well-shaped tree with the center of gravity squarely over the trunk. Develop a crown that allows the wind to flow through it, rather than being trapped in it like a sail.** (See *Photograph 3.*)



*Photo 3. Trees on home.
(National Oceanic and Atmospheric Administration)*



*Photo 4. Tree had been topped. Most limbs broke off at location of stub cuts.
(Florida Dept. of Ag. & Consumer Services)*

11. Tree topping and other improper pruning results in excess sprouting of new limbs which are poorly anchored. These limbs are easily damaged during a storm and can be considered dangerous. **Tree topping should be totally discouraged.** (See *Photograph 4.*)

12. For particularly valuable trees, have a professional arborist strengthen wide-spreading tree crowns by installing flexible cabling and/or rigid bracing when necessary.

13. Keep trees healthy and vigorous by periodically watering or fertilizing when required. Also, protect the soil surrounding trees from compaction or being lowered or raised. When necessary, soil aeration techniques may enhance oxygen flow to the roots and thus increase the vigor of the tree.

3.6 Planning Tips

1. Within the planning process, removal of hazardous trees is also part of prevention. A tree is considered a hazard when the failure of one or more of its parts could result in property damage or personal injury.

Note: To be considered a hazardous situation, the following must be present: A tree with the potential to fail, an environment that would contribute to the failure, and a target (person, object, property) that would be injured or damaged (Matheny and Clark, 1991). (See *Photograph 5.*) Under the law in most states, both public and private tree owners are required to recognize dangerous tree conditions and to correct them. Private owners, as well as municipal governments, can be held liable for injuries or damage to the property of others if they fail to remove a tree that falls under reasonably foreseeable circumstances. Refer to Merullo and Valentine's 1992 *Arboriculture and the Law* for detailed information.



Photo 5. Trees on home.
(National Oceanic and Atmospheric Administration)

2. Lightning protection systems, e.g. lightning controls and rods, are one form of device to protect mature trees which have high value.
3. When pursuing national disaster recovery funds, it is very important that a community have relevant tree-related documentation to support any funding requests. Consider completing a street tree survey or inventory. Tree inventory information and work records provide documentation to support these requests.
4. Locate and identify any trees or natural areas of special significance. These trees may have historical value, may be highly valued by the community, or may host rare or endangered species. Thus, plans should include care before, during and immediately after a natural disaster.
5. Keep copies of up-to-date land use plans, and identify locations where tree debris can be staged and dumped. Note any sites or natural areas that must be protected. These areas may be inadvertently used for debris storage, and thus damaged.
6. Keep multiple copies of local maps and land use plans for use by non-local individuals that may come and provide assistance. These individuals may be unaccustomed to the surroundings.
7. Develop a tree salvage plan to maximize usage of wood debris and minimize the amount that is landfilled or burned.
8. Prepare for a loss of normal means of communication (telephone) after a natural disaster. Cellular phones

are a good option.

9. Identify staff members that will be available during and immediately after a natural disaster. Develop work schedules that allow these individuals to rest and spend time dealing with the impact of the disaster on their own homes or families.

10. Establish a prearranged reporting procedure for forestry and field personnel that would go into operation automatically, depending on pre-specified weather conditions.

11. Develop written or video Public Service Announcements that can be easily modified and distributed before, during and after a natural disaster. Topics may include:

- Chain saw safety
- Safety hazards when clearing debris
- Debris disposal options
- Equitable vendor prices
- Selecting a qualified arborist or tree care professional
- Selecting quality nursery stock
- Benefits of trees, and the advantage of a healthy and safe urban forest
- How to identify trees worth saving

12. Develop a community tree ordinance that contains replacement standards.

13. Develop formats for post-disaster workshops that can provide technical training and assistance to citizens on tree repair.

3.7 Examples of Activities for Trained Volunteers

With any activity involving volunteers, it is critical that they know exactly what is expected of them. A thorough job description that lists all expected activities and responsibilities is an excellent resource.

1 . A trained volunteer with specific knowledge of the town's street names and community geography can help to guide contractual clean up crews to specific sites where trees were blown over or damaged. Note: Volunteers should not be sent to the field until all downed power hazards have been identified.

2. An assigned volunteer can be in charge of hand equipment such as axes, shovels and saws that are to be distributed to workers.

3. A trained volunteer could be in charge of records including an inventory of damaged or destroyed trees, time records of clean up crew, and clean up vehicle utilization.

4. A volunteer amateur radio operator may be used to facilitate communication, especially if telephone lines have been broken.

5. A highly trained volunteer with knowledge of basic tree planting and maintenance can participate in selected pruning, planting and tree care activities.
6. Volunteers with specialized skills such as photography, computers, drafting, and graphic design can augment programs.

3.8 For More Information

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Trees Forever. 1991. *Tree project handbook*. Trees Forever, 776 13th Street, Marion, IA 52303.

Appendices:

[Appendix A--The Right Tree for the Right Place](#)

[Appendix B--How to Recognize - and *Prevent* - Hazard Trees](#)

[Appendix C--Plan to Plan](#)

[Appendix D--Handbook for Volunteer Tree Projects](#)

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Chapter 3

Appendix A

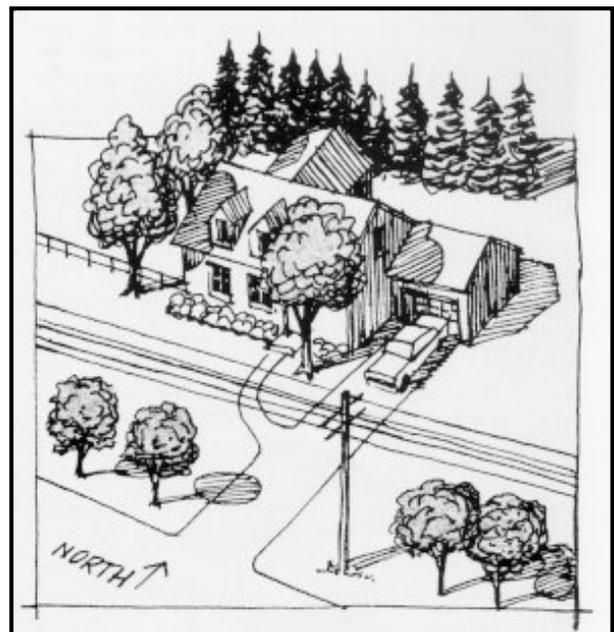
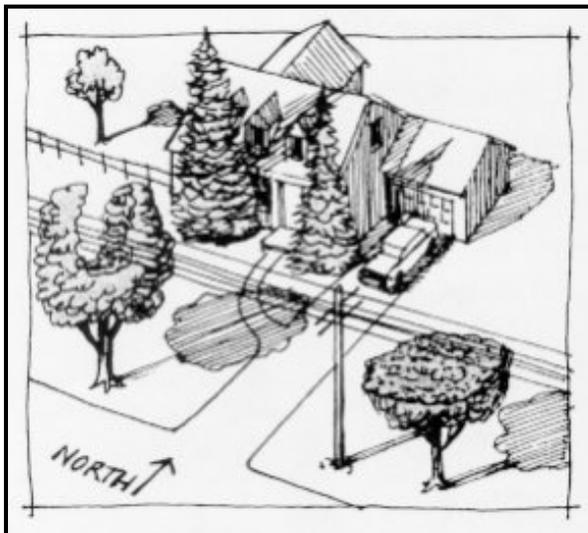
Bulletin No. **4**
James R. Fazio, Editor



The Right Tree for the Right Place

Any Friend of Tree City USA can list the many benefits of trees -shade, beauty, windbreak, privacy, cleaner air, less noise, less glare, and higher property values to name a few. But the key to these benefits is to select the right tree and plant it in the right place. The right tree in the right place not only assures a lifetime of satisfaction, it also keeps maintenance costs low.

"What is right?" may sound like an exam question from a class in moral philosophy, but in the green world it is not quite as complex. A tree's requirements to thrive, its form or shape, its size at maturity and its role or function in your landscape help determine the best tree to plant. Beyond that, the question enters the grey area of personal taste where what is "right" is largely a matter of opinion.



Wrong Planting large trees under utility lines often means mutilated trees. Large evergreens close to the house on the south block warming winter sunlight.

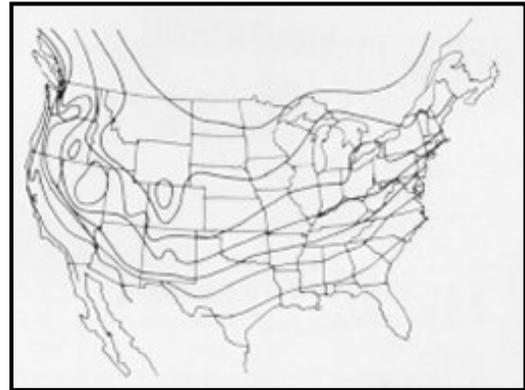
Right Short flowering trees don't clash with overhead utility lines. Large deciduous trees on the southeast, southwest, and west provide cooling shade in summer, and don't obstruct the low winter sun. An evergreen windbreak on the north blocks cold winter winds.

Environmental Factors to Consider

In selecting a tree, your first consideration must be what the tree needs. In other words, what environmental factors limit the ability of a particular species to thrive?

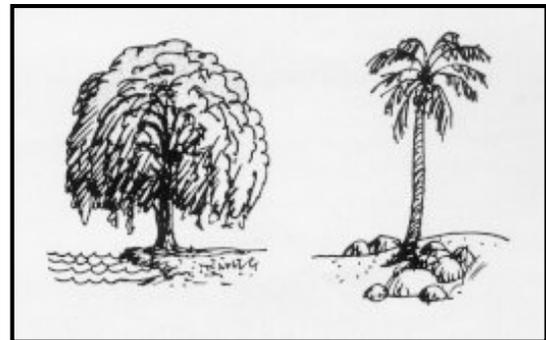
Minimum Temperature

The lowest temperature of the year limits the range of many trees. The familiar "hardiness map" has zoned the country based on average annual minimum temperature. Low temperatures, especially if they come suddenly, can freeze and kill the living cells in trees. Select a species suitable to the zone where you live. Caution: Elevation and exposure differences (the direction of the slope) within each zone also have an effect. North slopes, windy sites and higher elevations can make a site equivalent to one or two hardiness zones lower.



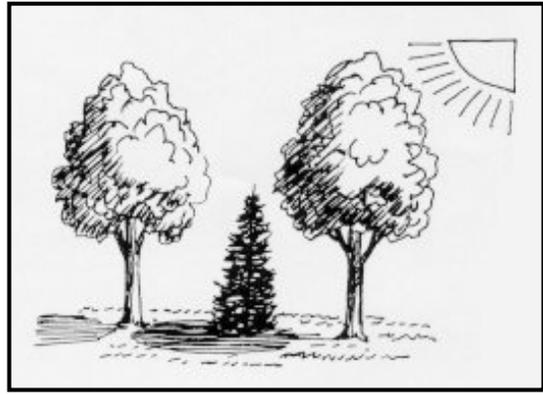
Moisture

Each species can tolerate wet or dry growing conditions to a different degree. Special attention must be given to your selection if the site periodically is flooded, subjected to very dry conditions, or is continually exposed to the drying effect of "rind. Watering, of course, can modify a dry site, but even when you irrigate it is important to know the optimal soil moisture requirement for your species. Tip: Since evergreens give off water (transpiration) from their needles all winter, it is important that they are well watered in the fall before the ground freezes. Also, do not overwater trees. They will "drown" if the soil is kept too wet. With heavy clay-type soils water no more often than at 7-to-10 day intervals during dry summer weather. Light, sandy soils could be watered more frequently. Watering every day or every other day is way too much, however.



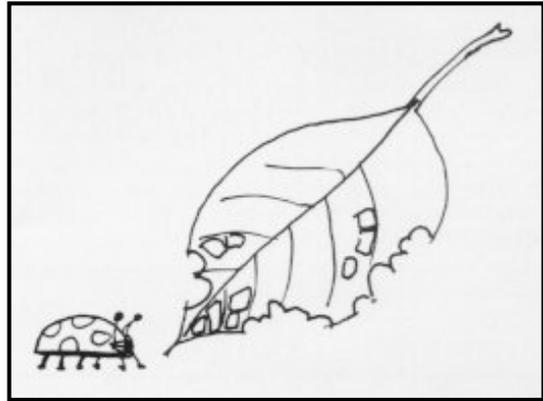
Light

Shade tolerance is the term foresters use to rate the light requirements of each species. Some species, like white birch or most pines, require full sunlight. They are shade intolerant. Tolerant species, like most maples, hemlocks, and lindens can do well in shade. Others, like white oak, are somewhere in between and are referred to as having intermediate tolerance. Don't make the mistake of planting your tree where it is mismatched with its need for light.



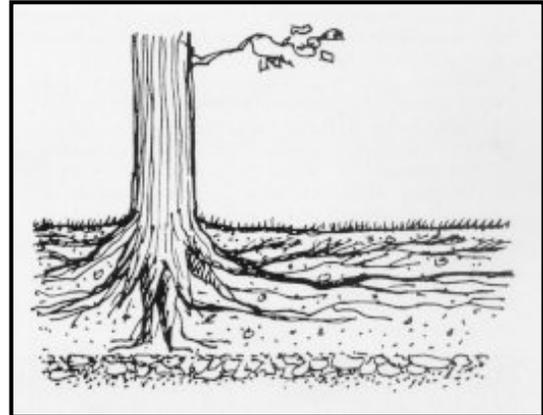
Pests

Every locality has its problems with a particular insect or disease. The best way to avoid trouble is to avoid the species that host these pests. In some cases, it is possible to buy varieties that have been bred for resistance to a disease. For example, where white pine blister rust is a problem, it is best to buy white pine that is certified to be blister rust resistant. Some species, such as goldenrain tree and ginkgo, are known for their natural resistance to most pests. Others, such as American elm, are just the opposite.



Soil

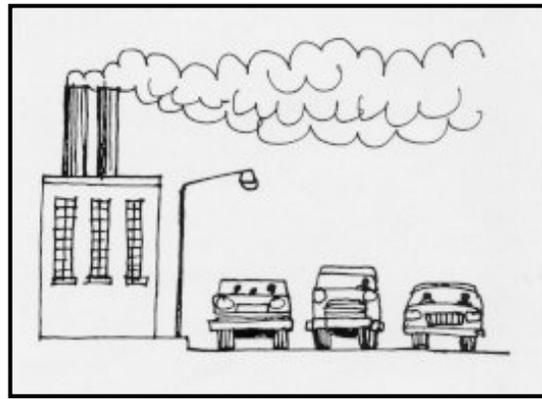
Soil factors are probably the most overlooked when selecting a tree. Soil depth, structure, and pH, in addition to soil moisture, can make the difference between success or failure after planting. For example, deep-rooted species will need adequate soil depth for their structural roots, whereas shallow-rooted species may do all right on sites where soils thinly cover bedrock or a hard layer of clay. Species that need light, sandy soil should not be planted in rocky or clay-type soils. Also, each tree species has a tolerance range related to acidity and alkalinity just as it does for shade. This requirement should be matched with the soil where you plan to plant. Soils are often disturbed in urban areas and trees which would typically do well may struggle due to poor soil structure. Compaction of the soil due to heavy pedestrian or vehicle use often reduces a tree's growth and size potential.



Air Pollution

Unfortunately, the ability of a species to tolerate air pollution is becoming more important. Chemicals in the air vary with localities, and in some cases the accumulative effects of pollution are just beginning to show up. The best course of action is to ask a local professional if there are problems in your town and, if so, what species are affected. Similarly, salt spray from either the ocean or street de-icing can be a problem locally and some species are more sensitive to it than others. Where these are problems, ask an

arborist, nursery professional, urban forester, or extension agent about which trees to avoid.



Tip:

Local nurseries generally do not carry trees that are incompatible with the local climate. However, for site factors other than climate, it is pretty much a matter of "buyer beware." Get the answers before you buy.

Tree Factors to Consider

1 The Tree's Purpose

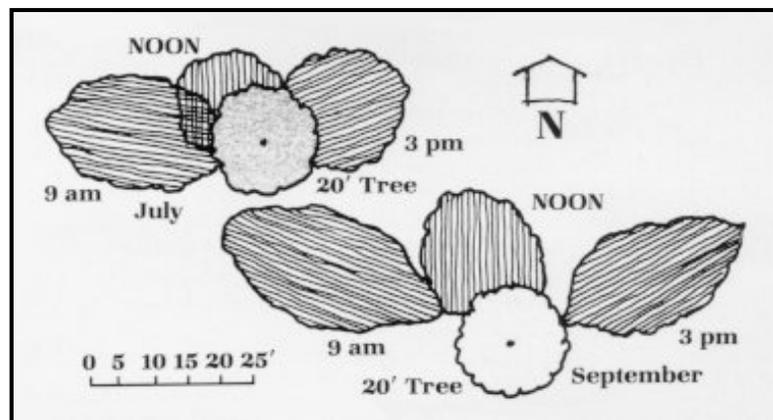
A tree's function is the purpose you want it to serve for you. Some of the most common are listed here to help make sure you get the right tree for the right place.

Shade

This is why many people plant trees, and well they should! Trees provide a greater cooling effect than man-made structures because not only are the the rays of the sun blocked, but water is added to the air through transpiration.

Observation is the best way to determine where to plant to maximize shade. In the drawing, notice the difference between July and early autumn. Plant for where you want the shadow during the hottest time of the year - and the time of day you desire the shade.

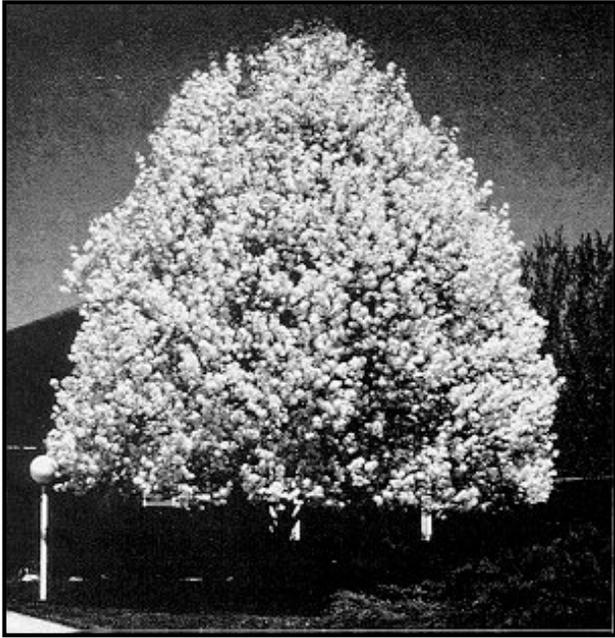
High, wide-crowned trees with deciduous leaves are the best providers of shade.



Aesthetics

Trees invariably add beauty to the home landscape, but 'with some planning this purpose can be served even better. One good principle is to never locate a tree where it will split your lot or a view into equal halves. Another is to use your trees to enhance the house and lot. For example, to give the lot an appearance of greater depth, plant on a diagonal line outward from the front corners of the house. This is called framing. Trees planted behind the house and to the side will provide background. Trees can also add visual appeal to a patio, pool or play area; or they can be used to separate spaces and provide space enclosure.

Accents: A tree with color or some other showy feature can be used as an accent point in your landscaping picture. Don't overdo accents. One accent plant in a given setting or "view area" is usually enough.



For visual accent, select a tree that contrasts with the characteristic landscape in one or more of the design elements - form, size, color or texture. The more contrasts, the stronger will be the accent.

Form or Shape: Should contrast with the predominant landscape character in a setting. For example, horizontal line may dominate in a rural midwestern landscape. Accent forms will be those that contrast with that character such as shapes that emphasize the vertical. Therefore, pyramidal, columnar, or upright oval tree forms will tend to accent. Weeping forms will also accent as they are uncommon to this characteristic landscape.

Size: A tree that stands out because of its large size will tend to accent.

Color: Planting trees for their spring flower color or fall foliage color is quite popular. While such color is often temporary, it is an important consideration. Summer foliage color, while not as intense, can lend an accent element of longer duration.

Texture: Foliage texture can be classified as fine, medium or coarse. If a tree's texture is used as an accent element it should be an abrupt change from textures that predominate in the characteristic landscape. Bark texture or picturesque branching structure can also complement an accent plant.

If you wish to have a strong point of emphasis, select a specimen tree with 2, 3, or even all 4 of these characteristics.

Windbreaks and Screens

Low-branching conifers that hold their foliage are most effective for screening unsightly areas and providing privacy. Noise is best reduced by tall, densely planted trees with fleshy, broad leaves. If combined with conifers, some noise reduction can be extended throughout the year. Dust can also be filtered by such a combination. Windbreaks can be made most effective through a dense, step-like arrangement of both conifers and deciduous trees. However, for protection on south and east sides of a house, deciduous species work best because they allow incoming solar radiation in winter.

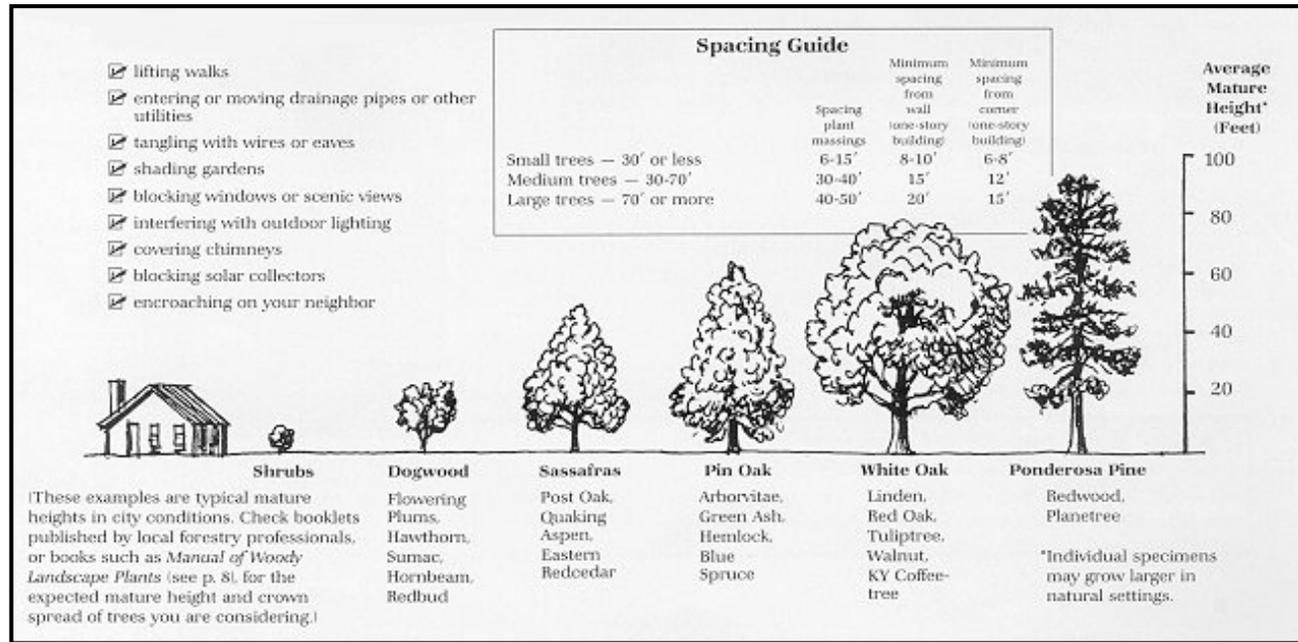
Boundaries

Trees can help to visually delineate your property. Small, narrow-crowned species will do the job while not invading your neighbor's space.

2 Size and Location

Available space is probably the consideration most often overlooked or misunderstood when deciding what tree to plant. Even for professionals, it is often difficult to envision the planting site 5, 10, or 20 years in the future. Yet this is essential. Before planting, know what the tree will look like as it nears maturity. Consider its height, crown spread and root space.

Some of the problems below can be dealt with by subsequent pruning. However, it is ideal to plant your tree to do what you want it to do while at the same time preventing it from:

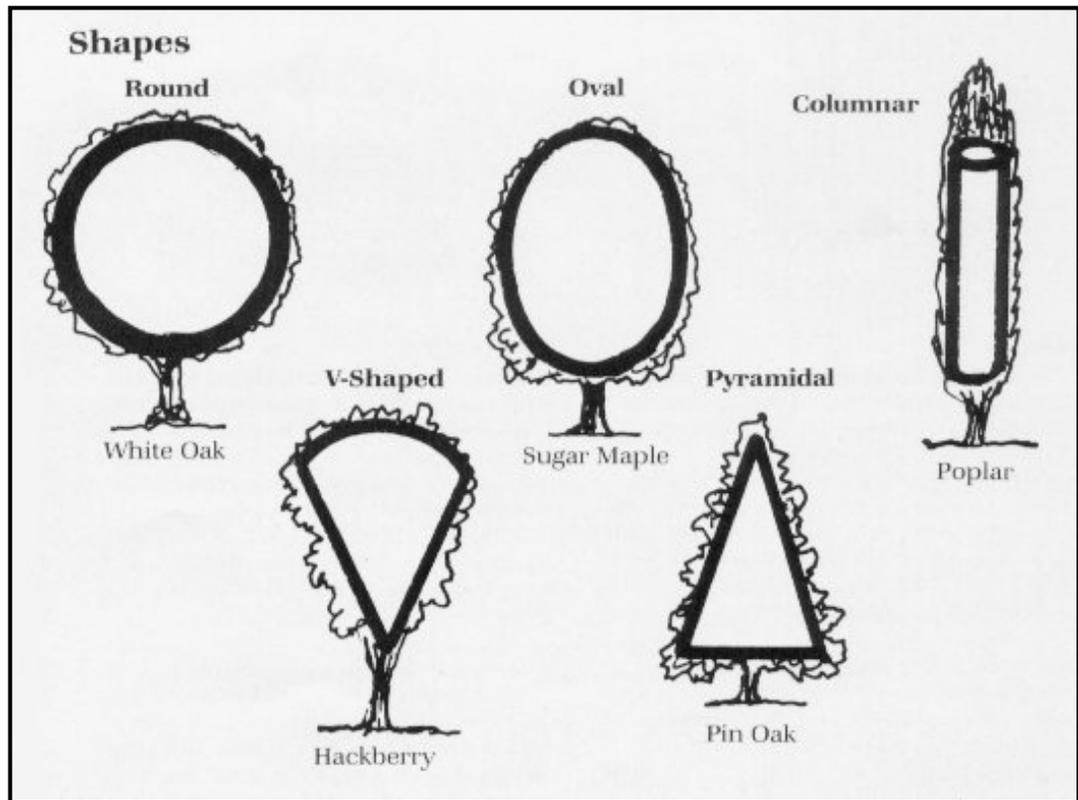


3 Crown Form or Shape

The character of tree crowns and thus the form or shape of trees varies among species as much as leaf shapes or bark patterns. Its shape is another clue to how well it will fit the space you have available, what problems might occur, and how well it will help meet the goals you have for your property.



A columnar variety of Norway maple makes an excellent street tree in this setting.



What About Planters?

Under some urban conditions there is no alternative to planting trees in planters or containers. Because of the severe conditions of restricted space for roots and exposure to freezing, it is essential to use a container that is as broad and deep as space allows. (Roots freeze more easily in narrow containers; the recommended minimum is 5' by 2' deep.)

When considering using planters, recognize that regular, conscientious maintenance will be needed and that the tree's longevity will be relatively short, requiring replacement. Other tips:

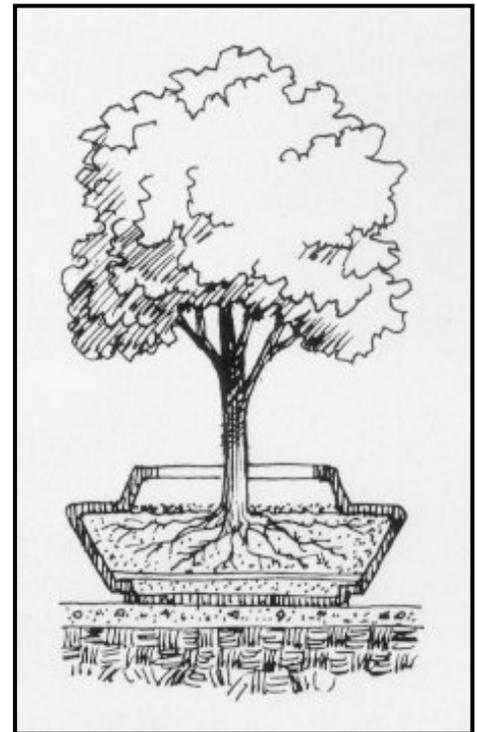
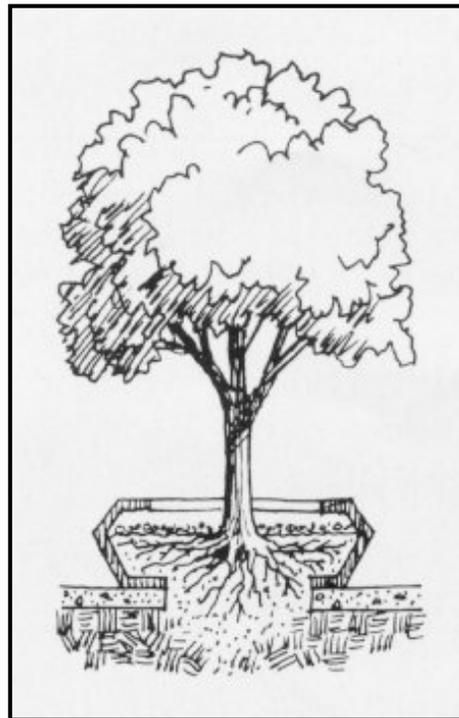
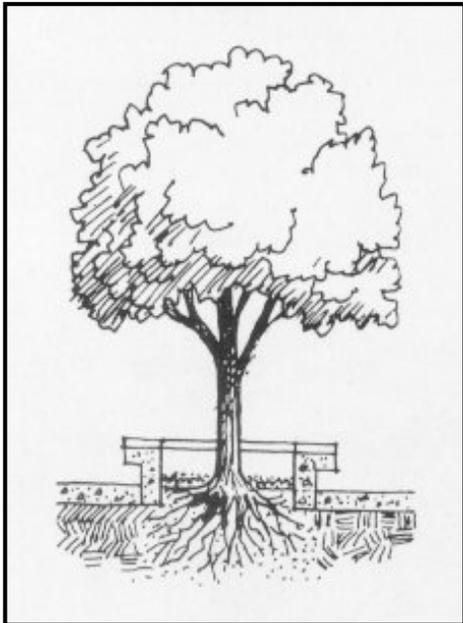
- In dry weather during the growing season, water at a rate equivalent to 1" of rain per week.
- Slope the bottom slightly toward small-diameter drain tile or 1" plastic pipe with holes drilled in it. Wrap in filter pads to prevent clogging and cover with 1" of sand. If no outlet is possible, place tile over gravel to help remove excess water.
- To reduce weight and aid aeration, a soil mix of coarse sand, organic matter or perlite, and a small amount of loam soil is necessary. Ask an arborist or nursery specialist what is used locally.
- The soil pH should be between 6.0 and 7.0.
- To help keep tree size small, fertilize only if a nutrient deficiency is indicated (by leaf discoloration).

A Few More Successful Species:

Crabapple	Honeylocust	Pin Oak	Green Ash
Callery Pear	Norway Maple	River Birch	Austrian pine
Mountain Ash	Littleleaf Linden	Swamp White Oak	Hawthorn



If you must use planters in a cold climate, it's best to use large ones with several trees. The earth mass helps protect the roots.



Good

Seat-wall ground-level planter, planted at grade. This planter has a neat appearance, fair aeration and root room, is convenient to water provides a place for people to sit and has a good sense of permanence. Trees planted in such a container are generally safe from snow-melt salt. are easy to mulch, and have normal frost tolerance. The container provides good drainage and offers a place to plant flowers. Disadvantages: These containers are expensive to build or buy, difficult to clean, may restrict pedestrian traffic and may interfere with snow removal operations. Root constriction limits the number of species suitable for planting in the open bottom container.

- Adapted from *Containerized Trees for Urban Settings* by Jean E. Olson, Iowa State University

Difficult

Raised planter with open bottom, soil level raised not over 1 foot above grade. This container is aesthetically pleasing, has excellent space definition, a strong sense of permanence, and provides good drainage, a place for people to sit, and a place to plant flowers. Trees planted in this type of container are generally safe from snow-melt salt and are easy to water and mulch. Deep roots can penetrate well below the frost line. Disadvantages: These containers are expensive to install, are usually limited to outdoor use, and may interfere with snow removal operations and pedestrian traffic. There are a limited number of tree species suitable for planting in this type of container due to root restriction. Shallow feeder roots of trees may freeze, reducing tree life.

Most Difficult

Closed-bottom container. This container is aesthetically pleasing, easy to install and move, provides a sitting area, and is relatively safe from snow-melt salt. Such containers provide good definition of space and are readily available at known cost in a wide variety of sizes, shapes, materials, textures, and colors. Trees planted in these containers can be placed in almost any location; exotic species can be used indoors. Flowers can be planted in this container. Disadvantages: Trees planted in closed-bottom containers are highly susceptible to salt buildup from normal watering procedures (unless drainage holes are provided), and to root freezing. The containers can burst from winter freezing. Tree species suitable for planting in this container are very limited. Does not work in colder areas of the country.

'Right Trees' and Urban Forestry Programs

All that has been said about selecting the right tree for the right place is as true for street, park and public building plantings as it is for residential properties. In fact, mistakes at the community level are magnified many fold. The widespread planting of a disease-prone species, or, trees too large or too small along an avenue, will eventually plague the taxpayers with costly maintenance bins.

Fortunately Communities served by an urban forester, or arborist are usually assured that species are selected with great care. In fact, if a staff forester, arborist or landscape architect is not employed by the municipality, it will pay great dividends to retain the service of a qualified consultant when planning for tree plantings. When such professionals are on staff, the ideal situation is to combine their expertise into a team. For example, the knowledge of a forester or arborist about the site requirements of a tree or its maintenance needs can often be joined with the artistic talents-of a landscape architect to produce a plan that is both workable and visually attractive.

The Education Challenge

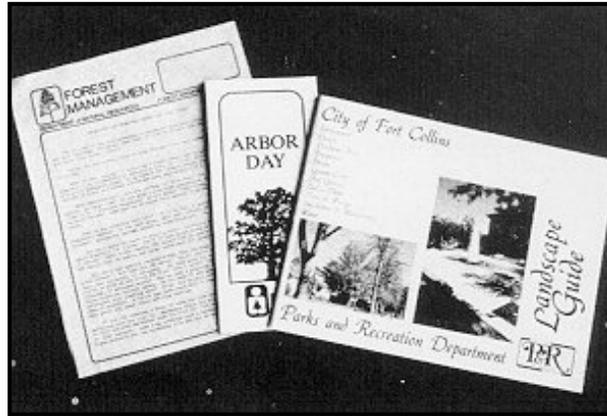
One of the challenges to all professionals is the large task of public education about trees. Helping homeowners and businesses to start their trees correctly through careful selection and placement is one of the greatest needs in the wide spectrum of tree-care topics. It is preventative medicine at its best. Fortunately, there is much material available to help including this bulletin. The need, however, is to: (a) "localize" the information, and (b) get it into the hands of the people who need it.

Information needed in community literature includes lists that show:



- species that thrive in the local climate, preferably arranged by tree characteristics and/or functions they best serve.
- species to avoid because they are known to have persistent insect or disease problems, or are sensitive to local air pollution.
- species that are prohibited or discouraged - and the reasons why.
- locations such as an arboretum, park campus or street where mature specimens of desirable species may be viewed.

Localize: *A local arboretum or nature trail is a good place for homeowners to see what their trees will look like at maturity.*



Getting the information into the hands of People who can use it is not easy. Budget constraints are often the first problem, but should not be allowed to stop the project. The publications that are illustrated above range from single-page fliers that can be duplicated at little cost on office equipment, to elaborate multi-color booklets. Whatever the cost, the investment will repay taxpayers in the long run.

Publicize: *Simple or elaborate, the important thing is to get information about tree selection into the hands of citizens.*

Distributing the publications should not be left to chance. The use of literature racks in the office or distribution at workshops reaches too few people. Door-to-door distribution in new developments, direct mail, and using local realtors, developers, and nursery operators are more effective ways to reach the entire population of tree owners.

Planning Ahead

In the urban forestry program, the best ideas for using the right trees in the right places can come undone when the desired planting stock is not available, or at the right price or size. Here is one solution that sounds simple, but is rarely practiced. Bob Skiera, forester for the City of Milwaukee, does plan ahead. Bob studies his streets and parks and plans for new plantings several years in advance. He then grows the needed stock in the city nursery and is assured of an adequate supply in his preferred size of 2-inch caliper. Similar arrangements could be made with contract suppliers and would give them the advantage of being sure of their future market. Either way, the result will be less reliance on chance, and more precision in planting the right tree in the right place.

Other Sources of Information

Tree City USA Bulletin will inform readers of helpful, up-to-date publications which provide more depth or that are readily available for community distribution. The editor welcomes sample copies to consider for inclusion in future editions.

There is plenty of information available to help you select the right tree for your purpose. Labeled trees in an arboretum, park or college campus provide a good opportunity to see what different species look like as they age. Another good place to begin is in the landscape

design or horticulture sections of your local library.

Booklets

A few booklets or leaflets are listed below, but **also contact your Cooperative Extension Office, State Forest Service, and local nurseries.**

Grounds for Gardening- A Horticultural Guide

University of Missouri

Extension Division

Columbia, MO 65211

This authoritative reference consists of a series of well-illustrated leaflets. They are 3-hole punched and would make excellent additions to your Tree City USA Bulletin notebook. Individual copies are free.

Recommended titles are:

1. *Developing the Landscape Plan* (G6901)
2. *Selecting Landscape Plants- Shade Trees* (G6800)
3. *Selecting Landscape Plants- Needled Evergreens* (G6815)
4. *Selecting Landscape Plants- Deciduous Shrubs* (G6830)
5. *Tree Placement on Home Grounds* (G6900)

Two good examples of community tree guides (single copies are available free):

1. *The Urban Forest- It's the Nature of Vancouver: A guide to Selecting and Planting Trees*
Kelly Puntaney, Project Manager
City of Vancouver
Parks and Recreation
PO. Box 1995
Vancouver, WA 98668-1995
2. *City of Fort Collins Landscaping Guide*
Parks and Recreation Department
Forestry Division
413 S. Bryan
Fort Collins. CO 80521

Books

Some of the more useful references are books that describe the tree characteristics discussed in "Tree Factors to Consider," plus flower fragrance, order and length of bloom, types of fruits, rate of growth, and many other traits helpful in making decisions about planting.

Three of these books are:

1. *All About Trees*
Barbara Ferguson, Ed.
Ortho Books
575 Market St.
San Francisco, CA 44105
2. *Manual of Woody Landscape Plants*
Michael A. Dirr
Stipes Publishing Company
10-12 Chester Street
Champaign, IL 61820
3. *Trees For American Gardens*
Donald Wyman
Macmillan Publishers
866 Third Ave.
New York, NY 10022

Audio-Visual Aids

"By the Way" is Cornell University's free leaflet that describes a series of audio-visual aids for rent that can help groups or individuals make the right decisions about tree planting. Available from:

Audio-Visual Resource Center-T
8 Research Park
Cornell University
Ithaca, NY 14850

From among Cornell's material, we recommend:

- Sidewalks of Shade
- Trees for Urban Roadways
- Trees for Confined Root Zones

To order additional Bulletin copies:

Friends of Tree City USA members may obtain a single copy of any Tree City USA Bulletin free of cost. Quantities of any issue are available at 25 for \$6.25 or 500 for \$100. To order; specify the issue number and quantity, and make your check payable to: The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410 The Bulletins available are:

- No. 1 *How to Prune Young Shade Trees*
- No. 2 *When a Storm Strikes*
- No. 3 *Resolving Tree-Sidewalk Conflicts*
- No. 4 *The Right Tree in the Right Place*

To join the Friends of Tree City USA:

To receive a subscription to the Tree City USA Bulletin and to become more involved in the urban forestry movement in your town and throughout America, send a \$10 dues-donation to Friends of Tree City USA, National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410. Make your check payable to National Arbor Day Foundation. Tree City USA Bulletin (© 1989 National Arbor Day Foundation. John E. Rosenow publisher; James R. Fazio, editor; Gerreld L. Pulsipher graphic design; Gene W. Grey, William P. Kruidenier, James J. Nighswonger, technical review committee. Although copyright is vested with the Foundation, permission is hereby granted for the contents of this bulletin to be reproduced for non-commercial educational or public-service purposes provided the source is acknowledged.



The Tree City USA program is sponsored by The National Arbor Day Foundation in cooperation with the U.S. Forest Service and National Association of State Foresters. To be named as a Tree City USA, a town or city must meet four standards:

Standard 1: A Tree Board or Department

Standard 2: A City Tree Ordinance

Standard 3: An Annual Community Forestry Program

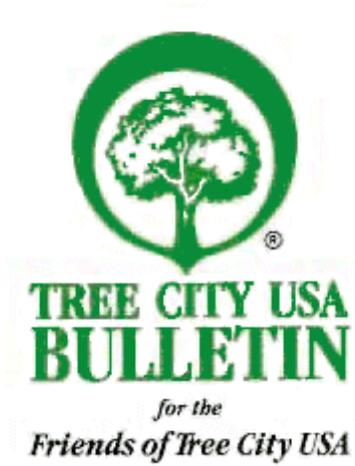
Standard 4: An Arbor Day Observance and Proclamation

Each winning community receives a Tree City USA flag, plaque, and community entrance signs. Towns and cities of every size can qualify. Tree City USA application forms are available from your state forester or The National Arbor Day Foundation.

Return to: [Chapter 3 - Preparing for Natural Disasters](#)

Chapter 3

Appendix B



Bulletin No. **15**
James R. Fazio, Editor

How to Recognize - and *Prevent* - Hazard Trees

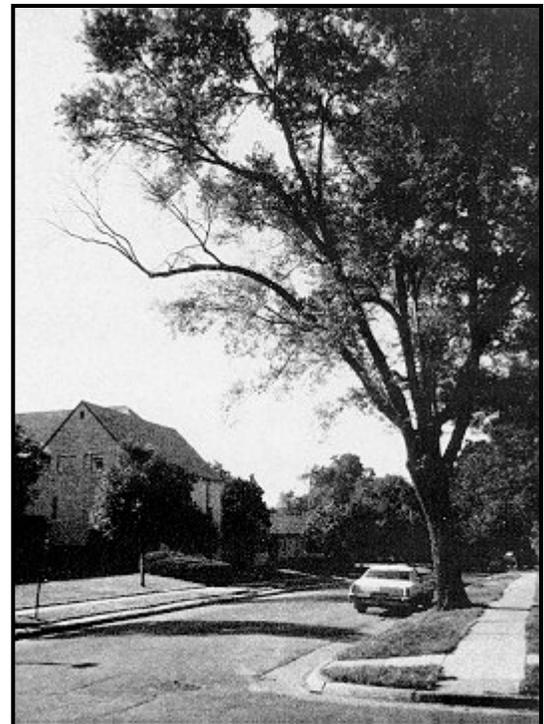
Worrying about hazards has resulted in the unnecessary removal of many trees. Although the problem of hazard trees needs to be addressed by every landowner and land manager, removal should be an act of last resort. Instead, some technical knowledge and a lot of common sense are the keys to preventing injuries, property damage and lawsuits due to unsafe trees.

There once was a young arborist who was placed in charge of the trees on a beautiful college campus. Most of the trees under his care had been planted decades before, then carefully nurtured over the years to provide shade and lend grace to the academic setting.

Not long after the new arborist arrived, trees began being felled and a "hit list" of others was presented to the faculty committee that oversaw such matters. Soon, the arborist was known as The Grim Reaper, a title out of character in a profession dedicated to prolonging the lives of trees!

After some investigation, it was learned that the arborist had been to a training session about hazard trees. The course had done such a good job in some respects that the man's sharpened eye saw potential trouble in nearly every tree. The course had frightened him so badly about potential injuries, property damage and, above all, liability suits, that he viewed tree removals as the only course of action. Old poplars in a park, a pear tree by a dorm and dead snags in the arboretum were viewed the same-and all were scheduled for removal.

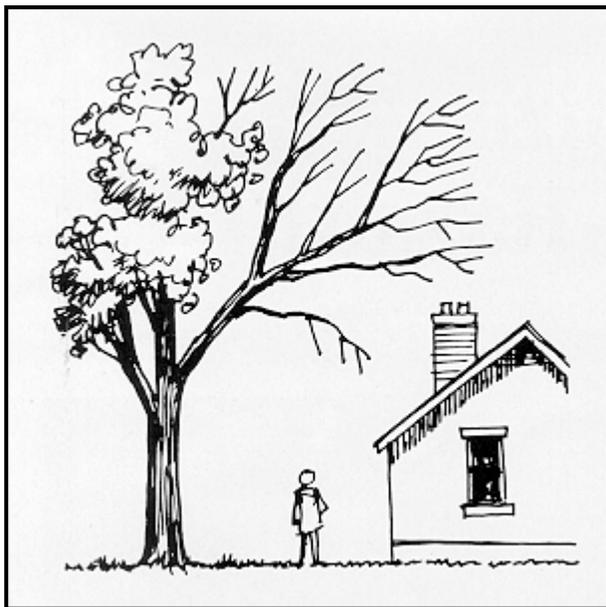
In this issue of the *Bulletin*, some of the signs that warn about dangerous trees are presented, as well as a reminder that those of us who own or manage trees are, indeed, responsible for the safety of people and property in the vicinity of our trees. But you will find no photos of dented cars or smashed houses. Scare tactics will backfire. The better approach is to learn to analyze the setting, consider the risks and benefits, and carefully plan for actions that prevent or correct hazards whenever possible. It is toward that end that this issue is dedicated.



Recognizing Tree Hazards

When damage, injury or death occurs because of a defective tree, the law usually holds the tree's owner responsible. (In a public place such as a park, this responsibility shifts to the managers of the tree.) Under the law, it is your duty to exercise care, good judgment, caution, and foresight by inspecting your trees regularly and recognizing situations that may cause them to break or fall.

What is a Hazard Tree?



A hazard tree has a structural defect that may cause the tree or a portion of the tree to fall on someone or something else of value.

What is *Not* a Hazard?



This is a legal grey area, but for a tree to be a hazard, a "target" must be within the falling distance of the tree or its part that fails. A "target" means people, vehicles and structures. Therefore, a defective tree in the woods or an open field or away from paths in an arboretum need not necessarily be considered a hazard. See *Bulletin No. 13* for a case to be made on behalf of leaving old or dead trees for wildlife.

To look for hazardous conditions, inspect each tree systematically. Start by scanning the top, using binoculars if necessary. After reviewing the crown, look downward along the trunk, then carefully examine the root zone. On the following pages are some important signs to watch for in your visual inspection.

1. Examine the Top and Crown

Differences In Species

Some species are simply more brittle than others. This is one reason why city ordinances sometimes prohibit or discourage trees such as willows, box elders and silver maple. Plant these trees only in open areas. If they already exist on your property, a minimum precaution would be to avoid locating play areas or patios beneath these trees.



Are There Dead Branches?

Loggers call these "widowmakers" and treat them with great respect. Homeowners should do likewise. Dead limbs are an accident waiting to happen. They can fall in the slightest breeze, when a mower bumps the tree, or a child climbs in it. They sometimes give way even on a calm day. Dead limbs are a red-flag signal for prompt action.



What's the Tree's History?

Sometimes past events warn of potential trouble. For example, previous topping will almost invariably result in weakly attached regrowth. Similarly, broken branches with stubs un-pruned, or sprout-like regrowth after storm damage, set the stage for breakage. Recent, seemingly unexplained loss of large limbs may also be a sign of internal problems.



Do Some Branches Cross or Rub?

Branches that cross or rub invariably lead to weak spots. These should be pruned off as soon as they are spotted, and the smaller the better.

Is the Tree Dead or Dying?

With the exception of trees for wildlife where structures or human traffic are absent or rare, dead and dying trees should be promptly removed. Felling a large tree is extremely dangerous. Call an expert to do the job.



How Vigorous is the Tree?

Evaluating a tree's vigor is somewhat subjective. However, experts say it is the surest early warning that there is a serious health problem in a tree. Vigor is reflected in the amount of leaf cover, and leaf size, color and condition. By comparing your tree with others of like size, you will be able to detect a less vigorous crown.



Why Branches Break



Large limbs can be weakened by rubbing, unrepaired storm damage, or poor pruning of side branches. The limb responds by forming barrier zones around each wound. These are weak spots that sometimes snap under the pressure of wind or ice.



A break at the branch collar is part of normal self-pruning, often caused by decay. Regular inspections for decay at branch junctions, followed by pruning, can prevent unexpected breakage.



Supporting trunk tissue sometimes gives way under stress. More research is needed to determine exactly why, but allowing large, horizontal limbs to develop may put unreasonable demands on the tree.

2. Check the Trunk

• Watch for Forked Trunks

Forked trunks are signals of potential weakness, especially if one side of the fork grows outward instead of upward like the other. Narrow-angled forks are also prone to infection, often indicated by sap or pitch being exuded. Early pruning of one side of the fork can prevent these problems; cables or braces are corrective actions taken by arborists to strengthen the fork in trees of higher value.



• Look for Signs of Decay

Clues to internal decay of the trunk or large branches are cavities, disfiguration (cankers) and the fruiting bodies of fungi (conks). Sometimes there are no outward indications. Arborists then use one of the methods shown below to check for decay.

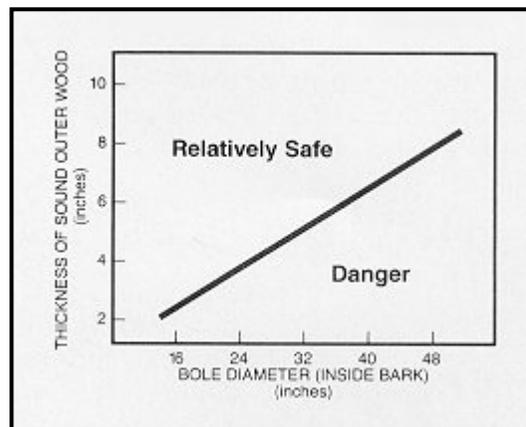
According to the USDA Forest Service, internal decay does not automatically render a tree unsafe. Working with pines, the Forest Service determined that if the amount of sound wood surrounding internal rot exceeds that established by the line on the graph, the tree can be considered relatively safe from failure.



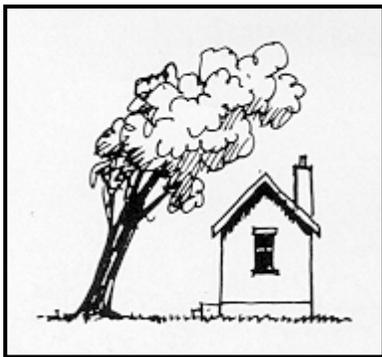
Canker



Conk



• What About Balance?



Leaning or lopsided trees present more of a hazard than those growing vertically, but if a tree has always grown off center, it generally is not an undue risk. However, any sudden lean indicates breakage or weakening of support roots and should be cause for alarm and immediate action.

• **Examine Wounds and Cracks**



Any trunk wound is an opening for decay. Wounds extending into the ground, including lightning scars, should be of particular concern and examined regularly. Some cracks, such as frost cracks, have little effect on the strength of a trunk. However, if two vertical cracks appear on opposite sides of the tree, it can be a sign of root injury or breakage. It is usually associated with a circumferential separation of wood internally and is extremely dangerous.

Tools Used by Arborists to Check for Internal Decay



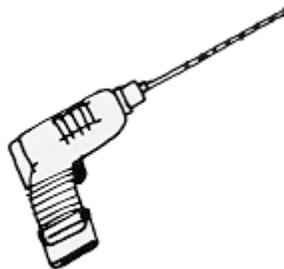
Mallet

This method is harmless to the tree but relies on differences in sound as the tree is struck.



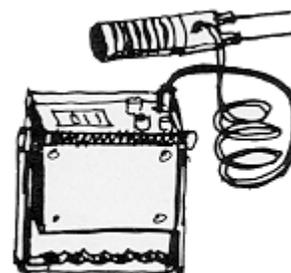
Increment Borer

A small core of the tree about 1/4" thick is removed and examined. This causes some wounding.



Drill and Bit

An electric drill and 1/8" bit can reveal rot through changes in drilling speed or ease, and condition of the wood chips extracted.



Shigometer

This instrument uses a pulsed electrical current to measure the resistance of wood, and thereby the presence of decay. Drilling is necessary.

3. Don't Forget the Roots

Roots are an important cause of trees becoming hazardous. Tree scientist Pascal Pirone reported that in his 30 years of examining tree

problems more than half were traced to root disease or injuries.

- **Any Signs of Root Decay?**



Root decay is often insidious and difficult to detect. Noted tree expert Dr. Alex L. Shigo calls the organisms that cause root problems "the sneaky fungi." Sometimes their work in weakening support roots goes completely unnoticed because the smaller feeder roots may go right on absorbing water and lawn fertilizer. Then, suddenly, one day the tree falls over! To detect root decay, look carefully for "mushrooms" on or near the base of the tree. If found, or if root trouble is suspected, have an arborist dig up some roots to sample for decay organisms.

- **Are Any Roots Severed?**

Trenching or construction within the root zone is a major cause of hazard trees. The problem is two-pronged. First, severed roots lose their ability to support the trunk and crown, especially if located on the windward side of the tree. Second, severed roots are open wounds that invite decay organisms. See *Bulletin No. 7* for ideas about saving trees during construction.



Note: Allowing roots to be cut, then watering and fertilizing to aid recovery is not a guarantee against decay. The reason is that decay organisms thrive on this treatment, too!

A Checklist for Preventing Hazard Trees

- Inspect your trees carefully several times each year and in all seasons. Annually, have a qualified arborist (See *Bulletin No. 6*) inspect your trees and provide you with a written report.
- Avoid planting brittle species where falling limbs could injure people or property. Some examples:
 - Silver Maple
 - Lombardy Poplar

- Box Elder
- Willows
- Prune trees when they are young (*Bulletin No. 1*) and regularly thereafter.
- Use correct pruning methods, always making the pruning cut outside the branch collar.
- Don't allow trees to be topped!
- Always plant the right tree in the right place. For example, avoid planting large-growing trees under power lines, or too close to your house, and make sure the species selected matches the soil and other site characteristics. See *Bulletin No. 4* for other ideas.
- Water deeply during dry periods, slowly applying at least 1" of water.
- Erect barriers around or slightly beyond the dripline of trees during construction. Insist that these root protection zones be honored by construction workers.
- Consider cabling or bracing weak forks or branches in older trees of high value. This is work for a professional arborist.
- Do not plant trees with narrowly-forked stems.
- Where a high value tree may be suspected of developing into a hazard, use landscaping to keep people at a safe distance. This may require techniques such as re-routing walks, moving patio furniture, or planting shrubs and hedges as barriers to foot traffic.

Remember: A healthy, vigorous tree that receives regular care is less likely to become a hazard than one that is ignored. Prevention is the best solution to the tree hazard problem.

A Case for Old Trees: Indiana University

Like the misguided arborist described on page one, it is easy to believe that any tree with a defect must be removed. Fortunately, allowance for a more prudent approach can also be found in the law. Besides a "reasonable" standard of care being expected, such as regular safety inspections, corrective actions may be weighed against *benefits*. Clearly, despite the difficulty in assigning monetary value to trees that all parties will accept, a no-trees or no-older-or-larger-trees approach to urban forest management would forego too many community benefits to be expected under the law.

Wise tree managers strike a balance between providing proper inspections, proper care, removal of un-correctable, dangerous trees and the retention of as many large, old-age trees as possible. Where safe, some dead trees are even allowed to stand for the benefit of wildlife and people who enjoy seeing wildlife.

In contrast to the college campus that harbored The Grim Reaper, Indiana University stands as a model of urban forest protection.

Indiana University's current site in Bloomington was once Dunn's Woods, a place referred to in 1884 as "unsurpassed in the State for its natural beauty." The founders were determined to keep it that way. Evidence that they succeeded is found in a commencement speech delivered 34 years later by Theodore Roosevelt when he noted the great maples and beeches and said that the scene was the most beautiful he had ever observed on a college campus.



Today the tradition lives on. Old giants that witnessed the arrival of the university's first students may still be found along the pathways and in the islands of green that dot the campus. Trees with broken tops or cavities that house the abundant squirrel population do not face the damnation of worried arborists. To the contrary, Superintendent of Grounds Michael J. Crowe says he would catch the wrath of top-level administrators if he removed anything but dead or seriously defective trees that clearly pose a threat to safety. Whether it is grounds keeping or the construction of a new building, the protection and proper replacement of trees to provide a complete, natural community of all ages are among the highest priorities on campus.

In an age of lawsuits, super-safety standards and artificiality, the words of former Chancellor Herman B. Wells bring perspective and guidance. In his last presidential address to the university's alumni, Wells said, "I hope our alumni will always insist upon retention of our precious islands of green and serenity -our most important physical asset, transcending even classrooms, libraries, and laboratories, in their ability to inspire students to dream long dreams of future usefulness and achievement -dreams that are an important part of the undergraduate college experience."

Tree Hazards and the Community Forestry Program

Lawsuits and countersuits are becoming part of the American way of life. It is said that in a single year as many as one suit per fifteen citizens may be filed. To the frustration of many, these actions are -shaping the way some communities provide services to their residents. Diving boards disappear from public pools, campgrounds close, fences go up and swings come down.

To prevent the threat of litigation dooming trees in public places, the first step is to understand the law well enough to keep your municipality, campus or institution from placing itself in an indefensible position. For this purpose, we recommend the following publication for an excellent overview of the legal questions and how they have been resolved in court: *Legal Liabilities for Defective Trees in the United States* by L.M. Anderson (Landscape and Urban Planning, 15 (1988) 173-184; Elsevier Science Publishers B.V., Amsterdam).

There are, of course, many variations in conditions, and in how state and local laws are written. Therefore, each case is unique in some way,

and there is no intent here to dispense the kind of legal advice that can be given only by a qualified attorney. However, from Anderson's research there are at least seven keys to staying out of legal trouble:

1. As research reveals new knowledge and urban forestry becomes more sophisticated, a higher level of duty to protect people and property from defective trees is expected. In short, up-to-date knowledge and the practice of good tree care is required.
2. Managers of trees in an urban setting **must** carry out frequent, close inspections of every tree within striking distance of a road or street. According to one court case, this means *walking* inspections, not drive-bys, and it means that inspections must be made more often than once a year.
3. Documentation of the inspection process is important, both to help plan and manage inspections and follow-up, and to provide supportive evidence in case of litigation. Computerized tree inventories can be a significant help in meeting these needs.
4. Trained inspectors must be used, because valid liability claims have extended to trees in which defects would not be recognized by untrained observers.
5. The warning signs of defective trees can not be ignored, nor is ignorance of urban forestry practices accepted as an excuse for damage.
6. Not hiring or contracting with a professional, or choosing not to develop an urban forestry program, does not excuse a community from exercising proper management of its trees.
7. The best defense against litigation is a sound, comprehensive urban forestry program. This must include not only systematic inspection of trees, but also responsible selection of species to plant, regular pruning, and general maintenance of tree health through watering and protection from pests.



Other Sources of Information

Tree City USA Bulletin will inform readers of helpful, up-to-date publications which provide more depth, serve as good models, or are readily available for community distribution. The editor welcomes sample copies to consider for inclusion in future editions.

Helpful Materials from Shigo

Probably no other single individual has done as much research and public education about understanding tree decay and hazards as Dr. Alex L. Shigo, former chief scientist and project leader with the USDA Forest Service. Some pertinent materials about hazard trees are listed below and are available from Dr. Shigo's consulting firm. Inquire about prices.

Shigo and Trees, Associates
4 Denbow Rd.
Durham, NH 03824
(Phone: 603/868-7459)

Tree Hazards -13 Questions That Could Save a Life (Leaflet)

A New Tree Biology (Book)

Tree Biology and Tree Care (Book)

Targets for Proper Tree Care (Article published in the *Journal of Arboriculture*, 9(11): Nov. 1983)



Videotape

Tree Health Management: Evaluating Trees for Hazard

Written and produced by E. Michael Sharon and Dave Steinke of the USDA Forest Service, this 39-minute VHS cassette presents trees as both friend and foe, explains the nature of tree defects, and presents a "reasonable" approach to evaluating trees for hazard. Available for \$25 ppd. from:

International Society of Arboriculture Research Fund P.O. Box 908, Urbana, IL 61801

Booklet

Detection and Correction of Hazard Trees in Washington's Recreation Areas: A How-To Guide for Recreation Site Managers by Lynn J. Mills and Kenelm Russell

Washington Dept. of Natural Resources
Forest Pest Management, MQ11, Olympia, WA 98504

This 37-page booklet is well illustrated and contains much information that is useful beyond the State of Washington. Single copies are free.

Article

Oak Tree Hazard Evaluation by Gary W. Hickman, Janet Caprile and Ed Perry. *Journal of Arboriculture* 15(8): August, 1989.

Although this article focuses on an evaluation method for only two species of oaks native to California, it also presents information about other evaluation systems and demonstrates the kind of information that needs to be considered when trying to develop an objective method of rating trees for hazard.

To order additional Bulletin copies ... Friends of Tree City USA members may obtain a single copy of any Tree City USA Bulletin free of cost. Quantities of any issue are available at 25 for \$6.25 or 500 for \$100. To order, specify the issue number and quantity, and make your check payable to: The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410.

To join the Friends of Tree City USA ... to receive a subscription to the Tree City USA Bulletin ... and to become more involved in the community forestry movement in your town and throughout America, send a \$10 dues-donation to Friends of Tree City USA, National

Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410. Make your check payable to: National Arbor Day Foundation.

To Help Publicize Trees ... ask for a free catalog of publicity and gift items available to help promote tree planting, tree care, and Tree City USA. Send your name and address to Arbor Day Catalog, National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410.

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Published for the
Friends of Tree City USA
by



The Tree City USA program is sponsored by The National Arbor Day Foundation in cooperation with the U.S. Forest Service and National Association of State Foresters. To be named as a Tree City USA, a town or city must meet four standards:

- Standard 1: A Tree Board or Department**
- Standard 2: A City Tree Ordinance**
- Standard 3: An Annual Community Forestry Program**
- Standard 4: An Arbor Day Observance and Proclamation**

Each winning community receives a Tree City USA flag, plaque, and community entrance signs. Towns and cities of every size can qualify. Tree City USA application forms are available from your state forester or The National Arbor Day Foundation.

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Chapter 3

Appendix C

Plan To Plan

By Brian Barnard

You own a small, aggressive professional tree care firm. The crew, including yourself, has been working very hard all summer. Business is great, but you're tired, the crew is tired and the equipment is stressed. It's peak season, but you decide to have dinner with the kids tonight, so you leave work promptly at 5:30. Exactly one hour later, the storm hits. As you grab your rain gear and head out the door of your now dark home, you tell the family where the flash light is and not to wait up. It's going to be a long night.

A similar sequence of events happened in Cleveland, Ohio, on Wednesday, July 28. A violent storm crashed into the city with 92-mile-per-hour winds. "I saw four-foot-diameter trees ripped from the ground," recalls Tom Mugridge, general manager for Forest City Tree Protection Co., Inc., in South Euclid.

Nearly 300 utility poles were destroyed and 150 main electrical feeders were down. Resulting power outages affected 300,000 residents in communities bordering Lake Erie, east of Cleveland. Trees were down everywhere, and the amount of work was literally overwhelming.



This Norway spruce in a suburb of Cleveland was split when struck by lightning.

Devastating storms have wreaked havoc in every city and town one time or another. Who could forget Hurricane Andrew's devastation in Florida, or Hurricane Hugo's destruction in the Carolinas? What about the ice storm in Rochester, New York? The effects of the Midwest floods will be felt for years. As a professional tree care firm, your ability to respond to storm damage in a timely manner with men *and* equipment allows you to provide the necessary emergency assistance your clients expect. You must plan to plan.

Being prepared

Forest City Tree Protection was surprised by the storm's fury, but not enveloped in the devastation. Company owner Lauren Lanphear quickly realized that the equipment he had available would not be enough to handle the task. At 9 p.m.

Lanphear called Mirk, Inc., for additional equipment. Mirk, Inc., is an equipment rental company located 60 miles south of Cleveland.

The Mirk, Inc., philosophy is simple: The more equipment they keep in readiness, the better they are able to respond to quick needs. Mirk keeps a large fleet of new and used rental trucks with buckets from 28 feet to 150 feet high. The company also offers truck-mounted cranes from five to 30 tons, as well as chip/dump trucks and trailer chippers.

By 9 the next morning, Forest City Tree Protection had a truck complete with a forestry chip box and a chipper sitting in the yard, ready to go. By Saturday, they had added a second truck with a 50-foot aerial lift unit, also with a chipper.

Besides the added equipment, Lanphear called another professional tree firm for assistance. Larry Holkenborg, owner of Larry Holkenborg Nursery, Inc., in Sandusky, Ohio, sent a seven-person crew, a crane, an aerial lift truck and a chipper for six days to assist in the cleanup.



The crown is removed from the damaged tree.

"We were prepared because we have the luxury - or advantage - of belonging to ISA and NAA. Because of this, you know a lot of people who are willing to help you out (in emergencies). You know people to call if you need help and you also know they will call you," Mugridge says.

Sometimes, however, even the best plans can't be carried out. In Florida last year, damage from Hurricane Andrew was so extensive that any preparations were useless. Bill Grubbs, owner of Golden Palm Landscaping and Tree Service in Miami, thinks of the destruction and all he can do now is laugh. "It was a little overwhelming. We had no phones or power for three weeks," the Florida native said.

Still, he came up with a plan. He had communicated with other firms in the area and they divided the anticipated work areas. They determined before the storm who would go where, and they would communicate by mobile phone. All the

planning was virtually worthless because even the mobile phones wouldn't work after the storm hit.

"I finally got to a phone and called the NAA. It was comforting to talk to someone," Grubbs says.

He knew other tree companies were trying to reach him but couldn't. There were no hotel or motel rooms, as the utility company had rented them all before the storm. All the campgrounds were blown away, and there was no gasoline for equipment. "Anyone that came down here to help had to be self-contained," Grubbs recalls.

Grubbs advises companies to get organized with other companies to prepare for emergencies. He was scheduled to meet at the end of last month with four other local firms to improve emergency response. Grubbs said this will give them a chance to "talk about what they learned other than the war stories."

Before a storm hits, Grubbs recommends that all equipment be full of fuel, and that plenty of chain saws are available, with gas mixed for them. "A generator would have helped," Grubbs adds.

Most important, Grubbs says, is-to have cash on hand. "Put several hundred dollars in your pocket before you hide underneath the mattress in the bathtub," Grubbs says with a serious sounding chuckle. "The banks will be closed, you can't write checks and you can't use credit cards."

Like Lanphear, Grubbs needed equipment. "I should have called Miami Bobcat the week before the storm," Grubbs says. After the storm, he had to wait some time to lease the Bobcat skidder he needed to clean up debris. He rented the skidder on a week-to-week basis, and after five weeks he bought the machine.

Coordinating the crew also should be explained clearly before a storm emergency. "If we were going to have a storm tomorrow at noon, I would let the crew out today at noon to take care of their own needs. They should be here the day after the storm," Grubbs suggests.

After Hurricane Andrew, Grubbs' crew was in disarray - for an entire month, only one full-time employee was available. To meet the workload, Grubbs relied on an agency to hire temporary workers to drag brush.

Grubbs urges tree companies to first think of their families, then neighbors and then clients - particularly those who have made prior storm emergency

arrangements. Grubbs tells of a woman who walked to his house for help because the roads were littered with trees and phones didn't work. She was not a regular client, however, and he never had a chance to fulfill her request.

Equipment and emergencies

Renting equipment is perhaps the most economically sound way to respond to an emergency. One of the advantages of obtaining equipment from a rental company is that it is immediately available without the need for credit inquiries, according to Dick Williston, sales manager for Mirk, Inc. Also, says Williston, "The length of the rental doesn't need to be determined up front. As in the Cleveland storm, Forest City Tree Protection didn't know whether they needed to rent extra equipment for a day, a week or a month. All they knew was they needed it right away."



Tom Mugridge, left, of Forest City Tree Protection Co., Inc., and Dick Williston of Mirk.

Leasing vehicles is another option to obtain equipment for storm work. Omni Leasing, Inc., offers quick and efficient financial services nationwide and has been committed to the tree care industry for more than eight years. The firm's specialty is lease-purchasing programs for 2-to-5-year terms.

In the event of a disaster, Omni points out that leasing new or used equipment is an affordable way for an arborist company to remain strong and continue to prosper. Deferred payment plans and seasonal plans are available.

Leasing large equipment from Omni is different from leasing an automobile from a dealer. "When you get to the end of the lease, there is either a 10% buyout or a \$1 cash buyout, rather than a 40% buyout some car leases have," says Brenda Foster, regional sales manager for Omni.

To lease a piece of equipment, the customer needs only to fill out a simple one-page credit application. The application consists of basic owner and company information, a bank reference and trade references. Upon approval, Omni will then contact the dealer to arrange for delivery of the equipment and payment.

Omni Leasing works with hundreds of dealers around the country to offer financial services for potential customers.

Storm emergencies take all the mental and physical resources a tree firm can generate. A responsible firm should have an emergency response plan devised and a good relationship with equipment dealers and leasing companies. This provides the opportunity to obtain additional equipment if the situation warrants. Communicate with associations and fellow arborists to ensure quality tree care for clients after a storm. Your neighborhood could be hit next.

This article was originally published in the September 1993 issue of Tree Care Industry, p 18-20.

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Chapter 3

Appendix D

HANDBOOK FOR VOLUNTEER TREE PROJECTS

This handbook has been developed to assist municipal leaders and volunteer organizations identify potential projects that are related to trees. This handbook does not contain all of the answers or aspects of every project, rather, it provides the reader with ideas from which to build.

Minnesota Shade Tree Advisory Committee
Community Outreach Taskforce

USDA Forest Service, Northeastern Area
State and Private Forestry
Lisa L. Burban, Urban Forester

1993

HANDBOOK FOR VOLUNTEER TREE PROJECTS

What does he plant who plants a tree?

*He plants, in sap and leaf
and wood
In love of home and loyalty
And far-cast thought of civic
good-
His blessing on the neighborhood
Who in the hollow of
His hand
Holds all the growth of
all our land.
A nation's growth from sea
to sea
Stirs in his heart who plants
a tree.*

-Author unknown.

Why Have a Volunteer Tree Project?

Volunteer tree projects are fun! All ages of people can be involved, from the very young, to the not so young. Any number of people can be involved in a project, from the individual to a large group. A variety of groups of people can be involved in tree projects, including: families, children, church groups, school groups, Scouts, Rotary Clubs, Kiwanis Clubs, and neighborhood groups. The purpose of this handbook is to get you interested and involved in tree project activities in your community.

Volunteer tree projects are a way to get people together for a worthy cause that can positively impact every one of them. Every day we receive benefits from trees. These benefits may be direct or indirect. For example, in the summertime, many of us will park our cars under shady trees, walk on the shady side of a street, or have a picnic under the cool shade of a large park tree. In the autumn, many of us will take special drives to view the beautiful colors of tree leaves as they turn red, yellow, orange, and brown. We especially appreciate the color of evergreen trees in the wintertime. Many of us decorate our trees with colorful lights for the Holidays. In the spring, we view the splendor of the flowering trees, and anxiously await the breaking of buds and the coming of leaves. The presence of trees around homes can help increase property value--in fact, wooded lots tend to sell faster than open lots. When planted in the proper location, trees can help decrease summer cooling bills, and winter heating bills. Trees have also been found to have

a healing effect on people, psychologically and physically. With this increasing awareness of the benefits of trees, people are beginning to realize the importance of maintaining the health of existing trees, and planting new trees. Volunteer tree projects that plant or care for trees help insure that we continue to receive these benefits (and more) from trees.

Volunteer tree projects benefit the community. They promote community pride, and help increase the quality of life. A community with healthy trees in its downtown and residential areas, makes that community more desirable to live in and work in. In fact, healthy trees can help attract more people and business to a community. Volunteer tree projects also assist the local forestry department accomplish things that otherwise may be neglected. Volunteer tree projects are very important. They make a significant positive impact on the community.

Three Basic Types of Projects:

A. Short term: simple and quick. Capitalizes on the energy already available. Gets publicity for your ideas, gets other people interested so that you may be able to move onto a medium or larger scale project. Requires fewer people.

B. Medium term: more time involved, but not a long term commitment. Requires more people with more tasks.

C. Long term: requires strong commitment (time and energy) from those involved. Larger projects, great potential for impacting many people for the long term.

Things To Remember (Tips for Project Success):

A. Invite a local tree care professional to provide training and guidance for tree care activities.

B. Need for a mix of projects. Start with a short term project to get people interested and excited, and move on to a long term project. Variety is important.

C. Never lose track of an individual that has expressed interest. Keep them informed of all activities, and potential areas where they can be involved.

D. Always work with local authorities when working in public areas.

E. Keep everyone informed. Let people know what is going on. For example, if you are planning a park beautification and tree planting project, let the Parks Department know---get them involved!! Government people must remember community people, community people must remember government people.

F. Identify where the "energy" is and take advantage of it. For example, if the energy is with a clean-up or beautification project, make trees a part of those projects.

G. Get people involved right away. The project may be wonderful, but if the people don't buy into it, you won't have support.

H. Recognize and take advantage of the fact that people have different needs as volunteers. Some people like to be planners and leaders, others like to be followers. Have opportunities for volunteers to take charge, and have situations where they can be told exactly what is needed.

I. Build enthusiasm with the group by having them focus on a vision of the final project. Provide them with something to look forward to.

Menu of Project Ideas

Any programs or documents mentioned in this section are listed under the "Additional Information" section (pages 6-8) in the back of this document

1. Short Term Project Ideas:

- Arbor Day Tree planting ceremony
 - publicize the event by inviting the mayor, city council or board members, or others to the ceremony (especially the press).
 - involve schools, church groups, neighborhood associations, etc.
- Landscape maintenance and repair projects: clean-up litter, plant trees, flowers or shrubs, prune smaller trees, replenish mulch around trees and shrub beds, add paint to park benches, light poles, signs, or buildings.
- Help the Forestry Department with a "Tree Care Day": remove guy wires or bracing wires from recently planted trees, remove tree wrap, add mulch to trees, water trees, prune smaller trees.
- Plant a ceremonial tree at a school. Get the PTA involved (perhaps they have money to donate for the purchase of the tree(s)). Have a

bake sale, penny collection, aluminum can collection, etc., to raise money to purchase the tree. Involve the school children.

- Bring a "tree element" into an existing project, for example a beautification or clean-up project.
- Promote a tree education day at the school. Have the children grow trees from seeds. Promote Project Learning Tree.
- Sponsor a Memorial Tree Planting ceremony.
- Adopt a tree-particularly valuable during dry summer weather, residents adopt a park tree or a parkway tree, and keep the tree watered during dry weather.

2. *Medium Term Project Ideas:*

- In appropriate areas, plant seedlings in a park or along a highway.
- Plant one or more of America's Historic Trees at a Centennial, 50 year, etc., celebration. Contact the American Forestry Association for more information about the America's Historic Trees program. The goal of this program is to teach history, environmentalism and conservation to adults and children through historic trees.
- Build a community sign. Include the name of the community, and any other information about the area. Landscape the area around the sign with trees, flowers, bulbs, and shrubs. Locate it at a focal point or entry place to the community, perhaps with the phrase, "Welcome to _____". Dedicate the sign at an Arbor Day Ceremony, or at a community celebration.
- Organize a tree exhibit in a community area. Involve schools and school children. Have a poster contest, t-shirt design contest, tree photography contest, etc., on any number of different tree-related themes.
- Encourage an Eagle Scout to complete a tree related Eagle Scout project. For example, the community of LaGrange Park, IL had an Eagle Scout work with the urban forester to plant seven trees in a community park. The Eagle Scout organized members of his Scout pack to assist in the planting of the trees.
- Start a community project where individuals, families, or groups can pay for the cost of a tree and getting it planted in return for getting a plaque put up in front of it (or in a public building) dedicating it to a special person.
- Promote a message campaign--develop and distribute topical door hangers about tree care.
- Encourage the planting of a large evergreen tree in a central location in the community. Hold a holiday tree lighting ceremony with this tree and other evergreen and deciduous trees in the community.
- Promote a community Christmas tree recycling program in

cooperation with the community forestry, parks, and/or public works department.

3. *Long Term Project Ideas:*

- Become a Tree City USA community if you meet the following standards:
 - A legally constituted tree body.
 - A community tree ordinance.
 - An active, comprehensive, community forestry program supported by a minimum of \$2.00 per capita.
 - An Arbor Day proclamation and public commemorative tree planting. If your community is already a Tree City USA community, work towards the Growth Award.
- Establish a composting location for leaves and garden compost. Work with the Department of Public Works to identify a location, provide equipment, etc. Work cooperatively with one or more communities to establish a composting location, if one is not available in your community. Contact your local Cooperative Extension office for more information on this topic.
- Establish a community garden, perhaps near the compost location.
- Cooperative roadside landscape plantings with the Minnesota Department of Transportation.
- Establish a multi-community "Tree Consortium". Example, several western suburbs of Chicago worked cooperatively with a specific nursery to order trees. Because of the larger number of trees per order, they were able to get trees at lower cost, and request different varieties.
- Encourage the local government to create an ordinance that requires trees to be planted along streets and in parking lots.
- Convert an empty lot into a community park. The Openlands Project in Chicago works with neighborhood groups in Chicago to provide technical assistance and assist them in converting vacant lots into small neighborhood parks.
- Help establish a green belt around the metropolitan area of a city. For example, the Greenways Program with Openlands in Chicago.
- Establish a community or school arboretum. For example, the City of Green Bay, WI worked with their local utility company to establish a small arboretum that featured trees suitable for planting near utility lines.
- Work with the forestry department to establish and complete a tree inventory. Example: Dodge Center, Minnesota. Involved local Boy Scout Troop, arborist, and high school.
- Establish an "Adopt a Spot", "Adopt a Grove", or "Adopt a Tree"

program.

- Create and train tree inspection teams for any number of tree needs, including: searching for gypsy moth egg masses, searching for dangerous trees, searching for planting spaces for trees, and searching for damaged trees after storms.

Organizing a Project -- A Checklist:

- Identify a project leader or project leadership team. Identify individuals that are committed to the project, and have the time necessary to complete the project.
- Identify a local tree care expert for guidance.
- Develop a basic plan for completing the project, include:
 - Project goal
 - Project components
 - Project timeline
 - Project site
- Identify people, agencies, and groups that will help develop a more specific plan for the project.
- Identify key media contacts and seek their involvement. Share project ideas. Invite to project planning meetings and activities.
- Identify additional people and groups to support the project.
- Identify and seek sources of financial, technical, and physical assistance for the project.
- Identify ways to keep participants and media updated and involved in the projects through letters, newsletters, phone calls, etc.
- Identify a person to photograph the project and any special events.

Additional Information:

Many resources are available for more information on tree projects. Consider the following reference documents and resource people for information and assistance:

References:

Harris, Richard. 1983. Arboriculture: Care of Trees, Shrubs and Vines in the Landscape. Prentice-Hall, Englewood Cliffs, N.J. 688 pages.

International Society of Arboriculture. 1991. "New Tree Planting". P.O. Box 908, Urbana IL, 61801.

Minnesota Arbor Month Partnership. "A Community Planning Guide to Arbor Month". 500 Lafayette Road, St. Paul, MN 55155-4044.

Minnesota Department of Agriculture. "Tree Owners Manual". To order, write: Bulletin Room, 3 Coffey Hall, University of Minnesota, St. Paul, MN 55108.

Minnesota Department of Natural Resources. "Minnesota Community Forestry Resources Directory". 500 Lafayette Road, St. Paul, MN 55155-4044.

Tree People, 1990. The Simple Act of Planting a Tree. Jeremy P. Tarcher, Inc., Los Angeles. 237 pages.

Trees Forever. 1991. Tree Project Handbook. Trees Forever, 73 pages.

Resources:

American Forests

P.O. Box 2000

Washington, D.C. 20013-2000

(Note: Through American Forests, you can receive (free of charge), the Urban Forests magazine. Simply write to them, and request to be placed on their Urban Forests mailing list.)

Heartland Center for Leadership Development

9410 Street, Suite 920

Lincoln, Nebraska 68508

Phone: (402) 474-7667

International Society of Arboriculture

P.O. Box GG

Savoy, IL 61874-9902

Phone: (217) 355-9411

Minnesota Arbor Month Partnership

c/o MN DNR

500 Lafayette Road

St. Paul, MN 55155-4044

Phone: (651) 772-7565

Minnesota Department of Natural Resources

Attention: Urban and Community Forestry Programs Specialist

Division of Forestry
500 Lafayette Road
St. Paul, MN 55155-4044
Phone: (651) 297-3507

Minnesota Department of Transportation
Landscape Division
Transportation Building
St. Paul, MN 55155
Phone: (651) 296-0623

Minnesota Extension Service
247 Coffey Hall
1420 Eckles Avenue
St. Paul, MN 55108
Phone: (651) 624-9298

Minnesota Green
c/o Minnesota State Horticultural Society
161 Alderman Hall
1970 Folwell Avenue
St. Paul, MN 55108
Phone: (651) 674-7752

Minnesota Society of Arboriculture
115 Green Hall
University of Minnesota
1530 N. Cleveland Ave.
St. Paul, MN 55109

The National Arbor Day Foundation
100 Arbor Avenue
Nebraska City, Nebraska 68410
Phone: (402) 474-5655

(Note: Contact the National Arbor Day Foundation for specific information about the Tree City USA Award and the Growth Award.)

OpenLands
220 South State Street
Suite 1880
Chicago, IL 60604-2103
Phone: (312) 427-4256

Project Learning Tree
Attention: Project Learning Tree Coordinator
DNR - Division of Forestry
Box 44, DNR Building
500 Lafayette Road
St. Paul, MN 55155-4044
Phone: (651) 297-2214

Trees Forever
776 13th Street
Marion, Iowa 52302

Twin Cities Tree Trust
4100 Vernon Avenue South
St. Louis Park, MN 55416-3199
Phone: (612) 920-9326

USDA Forest Service
State and Private Forestry
c/o Urban Forester
1992 Folwell Avenue
St. Paul, MN 55108
(651) 649-5245

CITY TREES

*The trees along our city streets
Are lovely, gallant
things;*

*Their roots lie deep in
blackened soil,
And yet they spread their
wings.*

*Of branching green or fretted
twigs
Beneath a sullen sky,*

*And when the wind howls
banshee-like
They bow to passers-by.*

*In fall their leaves are
bannerets
Of dusty red and gold
And fires dim that warm our
hearts
Against the coming cold.*

*Then delicate through winter's
snow
Each silhouette still
makes
Black filigree, with frostings
rare
Of silver powdered
flakes.*

*But leafed or bare, they
bravely rise
With healing in their
wings-
The trees along our city streets
Are lovely, gallant things.*

-Vere Dargan

Acknowledgments:

This handbook was prepared by the USDA Forest Service, Northeastern Area, in cooperation with the Minnesota Shade Tree Advisory Committee, Community Outreach Task Force. The author would like to thank Katherine Terzi, Northeastern Area, for her initial ideas and direction; and Ken Simons, Kirk Brown, and Ken Holman for their guidance and technical support in the writing of this document.

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Chapter 4

Natural Disaster Alert, Response, and Recovery

4.1 Chapter Summary

Identification of an appropriate early warning system for weather related disasters is critical. A variety of methods have been identified. A community must have a plan for responding locally to a natural disaster. The community's plan must be current and kept up-to-date, and the activities outlined in the plan should be practiced and understood thoroughly by all involved parties.

Smaller communities often depend upon the assistance of utilities, private arborists and neighboring communities for aid and assistance. It is critical that smaller communities keep the listing of telephone numbers of these groups current. Most medium- and large-sized communities have some form of a tree management or disaster mitigation plan. Two such plans from the communities of Oak Park, Illinois, and Milwaukee, Wisconsin are outlined and presented in detail. An example of how a private arboricultural firm works in a natural disaster is also provided. Any size community can take advantage of the services provided by these arboricultural experts.

4.2 Chapter Outline

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2. Immediate Reaction
 - a. Tree damage clean up priority
 - b. Public alley clearance
 - c. Forestry Division and Street Division communications
 - d. Equipment listing
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V. Commentary

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4.3 Early Warning Systems

Using the principles advocated in the foregoing planning and training sections, we recommend one of the following early warning procedures to enhance mitigation: communications with the National Weather Service, a consulting meteorological firm, a designated TV weather channel, or the local municipal police department. With one or more of these procedures in place, a municipality should have at least three to five hours of lead time before most tree damaging weather strikes.

Assuming that the disaster plan for the community has been updated and rehearsed, the Public Works Director, Street Superintendent, or delegate, should alert the designated disaster control supervisor to initiate action. At this stage, public works equipment should be readied for action. Public and volunteer components, cooperating municipalities and contracted tree service firms should be placed on alert and readied for action.

4.4 Disaster Planning for Small-Sized Communities

Early Warning and Immediate Reaction

Municipality population size usually dictates the details and form of the community's disaster reaction response. Refer to Table 2, Northeastern Region Municipalities Mitigation Characteristics, for an illustration of how small-, medium-, and large-sized municipalities of the Northeastern Region numerically aggregate into population classes, percentages of the total number of communities, percentages with mitigation plans, and sources of assistance.

In contrast to medium- and large-sized communities, small communities found throughout the Northeastern United States usually do not administer a public works department or a municipal tree section. Often a street superintendent with a modest staff are all that is available to attend to municipal infrastructure maintenance. Note: Maintenance includes immediate reaction to a disaster.

Smaller municipalities rely primarily on utility companies, private arborists and neighboring municipalities for aid and assistance during natural disasters, and afterwards for clean up. Unfortunately, only about 5 percent of the Northeast's smaller communities possess a detailed mitigation plan. (See Table 2.) Therefore, natural disasters are often managed inefficiently because of inadequate planning.

Table 2. Northeastern Region Municipalities Mitigation Characteristics

Size Class	Population	% of Total number of Communities	% of Communities with Mitigation Plans	Source of Assistance
Small	100 to 10,000	85	5	Utilities, Private Arborists, Neighboring Communities
Medium	10,001 to 50,000	14	50	In-house Public Works, Utilities, Private Arborists, Neighboring Communities
Large	50,001 to 7,000,000	1	100	In-house Public Works, Utilities

National tree service firms such as the Municipal Division of the Asplundh Tree Expert Company, the F.A. Bartlett Tree Expert Company, and the Davey Tree Expert Company, as well as smaller, local certified and licensed professional tree service companies stand ready to serve small communities in times of natural disasters. Many of the smaller, local companies are not trained to work near power lines. Fortunately, tree trimmers of the larger firms **are** qualified to work near energized power lines. In this situation, many utility companies can coordinate and interface with local, private arborists to remove hazardous branches and trees near power lines. Recognizing this need for coordination, communities should plan and prepare for this situation in advance.

Most utility companies can provide smaller municipalities with names, addresses and telephone numbers of local tree firms who can work outside of the power line zone. Note: Smaller municipalities, no matter what size their population, **should** have a current list of available tree firms. Optimally, in advance of any disaster, the municipality should establish a contract with a fully insured, if possible, ISA

certified, local tree service for emergency service.

Tree firms are listed in the yellow pages of the community's telephone directory. In addition, communities may wish to contact the national headquarters of the International Society of Arboriculture, for a list of tree firms are listed in the current ISA member directory. (Refer to the Reference section at the end of this chapter for address and telephone number information.)

4.5 Disaster Planning for Medium-sized Communities Based on the Oak Park, Illinois Plan

The Forestry Division (see Tables 3 and 4) of Oak Park, Illinois, (population 54,900), has devised a major tree damage control plan which is presented and serves as a model for a medium-sized communities (Stankovich, 1991). Table 4 summarizes the responsibilities of the Forestry Division staff.

**Table 3. Oak Park, Illinois
Department of Public Works**

Division	Number of Personnel
Automotive Fleet	14
Engineering/ Administration	10
Forestry	14
Signs	3
Steet Light	3
Streets	32
Water and Sewer	18
TOTAL	94

**Table 4. Oak Park, Illinois Forestry Division
Responsibility Summary**

Village Forester

- Has overall direction for storm clean up efforts
- Reports to the Public Works Director on decisions relating to storm clean up efforts and advises on the need for outside assistance (contractors, other public works divisions)
- Is responsible for decisions relative to abandoning other divisional responsibilities in favor of storm damage clean up efforts
- Works with Communications Director for alerting media as to the progress and problems associated with the storm

Assistant Village Forester

- Coordinates the involvement of Forestry and other crews
- Inspects of damaged property (Village and private)
- Is responsible for maintaining other Divisional functions

Lead Forester

- Performs overall coordination of field activities related to storm damage
- Coordinates and assigns duties to personnel assisting the Forestry Division
- Is responsible for decisions related to staffing, equipment usage and disposal of wood waste
- Reports to Assistant Village Forester on progress of storm clean up

Urban Forestry Technician I and II

- Performs actual clean up work
- Repairs minor equipment used in clean up efforts
- Responsible for care of equipment and tools

An outline of Oak Park's Major Tree Damage Control Plan is listed below. It consists of twelve points found under two major headings: "Early Warning," and "Immediate Reaction."

Oak Park Major Tree Damage Control Plan

- I. Early Warning
 - A. Supervision of major tree damage control
 - B. Weather warning
- II. Immediate Reaction
 - A. Tree damage clean up priority
 - B. Public alley clearance
 - C. Forestry Division and Street Division communications
 - D. Equipment listing
 - E. Additional equipment and assistance
 - F. Brush removal from private property
 - G. Life threatening situations and property damage on private property
 - H. Brush disposal
 - I. Record keeping
 - J. Damage assessment

I. Early Warning

A. Supervision of Major Tree Damage Control

The Village Forester, followed by the Assistant Forester (Public Works Foreman), will be in charge of storm clean up efforts. Duties and assignments will be discharged by these individuals to the Forestry Division Leadperson. Should the Forestry Division need the assistance of other Public Works Divisions (upon approval of the Public Works Director) the Forestry Division will contact the appropriate Division supervisors.

B. Weather Warning

In Oak Park, the Forestry Division is informed of potential severe weather by telephone and fax machine from a climatological consulting firm. Three to five hours lead time are usually provided before the onset of weather conditions which may cause tree damage. Note: The most critical period during the year for potential tree damage is when leaves are still on the trees (May through October); however, severe tree damage may occur at any time. Information from the weather consultant is relayed on a weather reporting form.

Based on weather condition information, the decision is made by Forestry Supervisory staff to alert the proper crews. In addition to the initial call from the weather consultant, a system for obtaining supplemental updates on weather conditions is at the disposal of the Forestry Division Supervisory staff. At this time, the equipment used to clean up tree damage should be readied for action.

A system for notifying Forestry Division staff should be established. In certain situations, the Forestry Division staff can be advised by the Police Department that tree damage has occurred in the Village. At other times, staff may be contacted using some form of a "branching" or "phonetree" calling system, where each person is responsible for notifying another. In any case, this system must be established and kept up-to-date for a rapid and efficient storm response system.

In addition, the Forestry Division staff should be provided with a list of emergency telephone numbers that enumerates Village personnel and can assist with situations encountered during severe weather.

II. Immediate Reaction

Tree Damage Clean up Priority

CLASS I

First, all life-threatening situations should be given priority. Supervisors should make an on-site visit to determine the severity of the damage in the event of multiple hazardous situations. Crews should remedy the situation to a point where it is no longer life threatening before proceeding to the next location. Final clean up should wait until all life threatening situations are resolved and all streets have been cleared.

CLASS II

Second, all major property damage instances should be remedied to a point where the crisis is abated. Supervisors should personally inspect and determine the priority of the Forestry Division responses. Again, final clean up at those sites should wait until all streets and specialized areas are cleaned up.

CLASS III

Third, preferential streets (considered to be all main thoroughfares) should be cleared of fallen trees and debris. State and county highway departments may be called to clear U.S., state and county routes. This should be followed by clearing

residential streets and then parking lots, cul-de-sacs and other specialized areas, including parks. Because the specialized forestry skills required to abate life-threatening and property damage situations would be utilized immediately, the street clearance work (in case of widespread and severe damage) may not be undertaken by Forestry Division personnel until sometime well after the storm has passed. In this situation, the Village Forester should recommend to the Public Works Director that other public works crews be considered to assist in street clearance work. Immediate supervision of these supplementary crews would be under the direction of their respective divisions.

Public Alley Clearance

Many municipalities have the responsibility to provide clear passage through public alley thoroughfares. Often these alleys incorporate the majority of the utility line systems within them. During severe weather, trees growing on private property can fall into the alleyway blocking portions of the alley roadway. Consequently, when trees or limbs fall from trees bordering alleys, they often become entangled with the utility lines. Most utilities prohibit anyone except their own crews from attempting to clear fallen trees from utility wires. Note: This policy varies with utility companies. Because many communities exist within an electrical service district that encompasses multiple municipalities, there is great likelihood that it may take several days to respond to all tree and power line conflicts, particularly during violent weather producing widespread damage. In these instances, barricades should be set up to warn residents of the hazard.

Forestry Division and Street Division Communications

Constant communication during emergency situations is vital. Communication aids in improved response time, efficient crew scheduling, and in alerting emergency personnel of hazardous situations. All forestry vehicles should be equipped with two-way radios. Additionally, pagers are useful communication devices. However, during storm clean up work, the need often arises to contact people who do not use Public Works Department radios. These include: fire and police personnel, utility crews, contract crews employed for storm clean up, and others. Severe storms may destroy normal systems of communication such as radio towers and telephone lines making normal telephone service useless. These systems may not be repaired for days or several weeks. Identify several alternative communication systems for backup. Backup systems may include cellular phones, equipment from other agencies or nearby communities and ham radios.

Equipment Listing

A listing of Public Works Department equipment and vehicles available for tree clean up work should be developed and kept current. The list may include wood chippers, aerial bucket trucks, refuse packers, prentice loaders, supervisory vehicles, chain saws, barricade and lighting equipment, hand saws and pole pruners.

Additional Equipment and Assistance

When necessary, the municipal administrator may authorize the rental of additional equipment for storm clean up work. A list of potential vendors should be developed and kept current. Additionally, tree contractors may be authorized to work in the community to supplement municipal crews. As with the list of potential vendors, a list of potential contractors should be assembled. Depending on the path of a storm, there may be other municipalities in a geographic area which remain unaffected by the severe weather. Establish a system to contact these communities in the event that they could send staff and equipment to assist your municipality in its clean up efforts.

Brush Removal From Private Property

A system for handling tree debris removed from private property must be identified. Municipalities vary in both practice and policy regarding brush and related wood waste removal, as well as disposal from private property.

Authors' Note: If a major storm makes it difficult for private property homeowners to remove brush and debris, a decision should be made at the municipal level allowing for debris to be collected. Notethata community must determine if it has adequate equipment and staff available to accomplish this often enormous task. It is critical for the municipality to provide guidelines for residents specifying the types, amounts and piling arrangement of the materials that will be accepted. Municipalities may wish to assist private homeowners who will contract with private companies for trimming and removal by providing information about companies that are fully licensed, professionally trained and insured (Hermann, 1993).

Life Threatening Situations and Property Damage on Private Property

Normally, all tree work required on private property is the responsibility of the individual property owner. However, if in the opinion of police or fire department personnel the situation requires immediate attention, then forestry personnel should enter onto private property and take necessary action to solve the problem.

Note: The municipality must be properly insured for this tree work to cover any

potential lawsuit or liability due to personal injury or property damage. Clean up is the responsibility of the homeowner. Tree damage (during storms) is not limited to public property--it will also occur on private property. The Forestry Division will provide information to residents on how to hire a tree contractor and can also provide a listing of licensed tree contractors. Basic tree care information should also be provided for homeowners.

Brush Disposal

The Forestry Division develops a budget for normal disposal costs associated with yearly tree maintenance tasks. Major tree debris disposal will require additional funding which may be authorized by the Village Manager.

Record Keeping

All Divisions which are involved with storm clean up should keep accurate and detailed records on equipment and staff hours. Their records will provide important information in the event of financial reimbursement from federal or state agencies, or in case of questions or confusion regarding use of staff, equipment or funds.

Damage Assessment

A critical tool to assist any emergency response is a current tree inventory of all publicly owned trees. Using the inventory, the Forestry Division can determine the actual damage to the urban forest. Accurate damage (in dollars) can be assessed and submitted for potential reimbursements. Specific costs can be developed for the repair of the urban forest (pruning, removal, cabling, and rodding) and for replanting efforts. Experience in other Illinois communities has shown that in the event of major storm damage, substantial monetary reimbursement can be given to communities that can produce accurate documentation of their losses (Skiera, 1990). Federal funding may cover 75 percent of these costs, while State funds reimburse 12.5 percent. The community would then be responsible for the remaining 12.5 percent.

Authors' Note: An additional phase that evaluates response is highly recommended after disaster activities have been completed. Time should be taken to assess response alternatives and activities that worked or failed, in order to maximize or enhance effectiveness during the next emergency.

4.6 Disaster Planning for Large-sized Communities Based

on the Milwaukee, Wisconsin Plan

Background

Since 1984, Milwaukee, Wisconsin (population 636,000) has utilized a well-developed "Emergency Storm Response Plan." The plan has been revised five times, with the latest version dated August 15, 1990. The 30-page document was developed by the City's Department of Public Works, Bureau of Forestry, with the guidance of the City Forester (now retired), former International Society of Arboriculture President, Robert Skiera.

For the purpose of this manual, the Milwaukee Response Plan will serve as a model for large-sized communities (Ottman, 1990). The following commentary and procedures are derived or quoted from Milwaukee's most recent plan. Milwaukee's plan attempts to establish uniform operating procedures that will assure efficient and effective response to storm conditions. Timely and effective response to storm situations is one of the primary functions of the Bureau of Forestry. Receiving and analyzing storm warnings, deciding the magnitude and timing of clean up operations, alerting personnel, and continually observing operations and conditions as a guide in directing strategy are all vital parts of these response operations.

Primary responsibility for storm damage clean up lies with the Bureau of Forestry. However, under the direction of the Commissioner of Public Works, all bureaus of the Department of Public Works (DPW) may become involved in storm clean up under major storms or unusual circumstances. Under these circumstances, inter-bureau cooperation in the sharing of staff and equipment is critical to providing the timely and efficient clean up services that the citizens of Milwaukee expect.

The Forestry Division Supervisor has overall responsibility for coordinating storm response. Additionally, the following activities are the obligation of the Supervisor:

- provide early warning of impending storm conditions,
- monitor storm intensity,
- coordinate movement of crews from one district to the other where damage is unevenly distributed among the districts, and
- report storm damage assessments and storm clean up progress to the City Forester and Commissioner of Public Works.

The Bureau of Forestry is divided into three major operating units. These units are the Administrative Division, the Forestry or Tree Division, and the Landscape or

Boulevard Division.

Under emergency situations, the Administrative Division will serve to:

- handle incoming notices of tree damage from citizens or other governmental agencies,
- expedite the purchase of supplies and materials necessary in the storm clean up effort,
- monitor storm clean up progress,
- expedite obtaining outside help from other Department of Public Works (DPW) Bureaus and private contractors,
- provide storm clean up services, and
- serve as the immediate contact to inform the public of the City's situation with respect to the storm.

The Bureau of Forestry shop is also included in the Administrative Division. Also under emergency situations, the Forestry shop gives priority to any storm fighting implement. Personnel are assigned to repair and sharpen chain saws and brush chippers.

The Forestry or Tree Division of the Bureau operates out of three district forestry field headquarters. Each of the three districts is primarily responsible for damage caused within district boundaries. Under emergency situations, the functions of the Tree Division are as follows:

- clean streets and public ways of uprooted and damaged trees,
- clear private properties of storm damaged trees,
- modify or abate potentially hazardous conditions resulting from storm damage, and
- alert and assist other agencies if needed.

Each district is staffed by a District Supervisor and an Assistant District Supervisor, four working foremen, and approximately 27 arborists. The District Supervisor is primarily responsible for assessing storm damage within the specific district, prioritizing of storm calls, directing field crews in the clean up effort, reporting an assessment of storm condition, and staffing needs and clean up progress to the Forestry Operations Supervisor. Under the direction of the District Supervisor, the Assistant District Supervisor directs field crews responsible for actual work performed in the clean up effort.

In emergency situations, the Boulevard Division personnel are integrated into the Tree Division clean up effort as the need arises. The scope of the involvement of

the Boulevard Division is dependent on the nature of the emergency. In the most severe circumstances, the Boulevard Division managers would aid in the pickup of brush. Boulevard Division managers would be assigned to a specific Tree Division district and report to the District Supervisor of that district. Their primary function would be to assist in setting priorities for clean up efforts and to monitor the progress.

Components of the Milwaukee Emergency Storm Response Plan:

Early Warning

Immediate Reaction

A. Chain of command and major functional responsibilities when a major storm strikes

1. City Forester
2. Assistant City Forester
3. Business Operations Manager
4. Forestry Operations Supervisor
5. Landscape Operations Supervisor
6. Forestry District Supervisor
7. Forestry Technical Services Coordinator
8. Arborist III
9. Arborist II
10. Arborist I

B. Call-out procedure

C. Receiving and dispatching calls

D. Priority ranking of storm calls

E. Trees growing on private property

F. Reporting property damage

G. Maintaining a log of emergency service activities

H. Clean up activities

I. Coordination with other Bureaus

J. Cost accounting

K. Forestry Shop functions

Early Warning for Large-sized Communities

Without question the most vital, yet least tangible of all the elements of a storm damage operation, is the sifting and analyzing of storm warning forecasts and the making of decisions as to the extent, timing and magnitude of anticipated clean up

operations. Milwaukee, like Oak Park, employs a consulting meteorological firm to provide early warning information to the Bureau of Forestry. The consultants transmit by telephone, detailed information in accordance with a check sheet designed specifically to assist the Bureau in making predictions and predictive decisions relative to impending storm conditions. The forecast information, as telephoned to the Bureau, indicates the type of storm, intensity, time and duration, and probability, as well as any changes in the forecast as they may occur. The Forestry Operations Supervisor is responsible for receiving this weather information, reviewing the forecast and directing the appropriate preparation for impending storm conditions.

To assure that a supervisor is available at all times to receive and analyze such warnings, a calling list is provided to the meteorologists on an annual basis. This assures that a logical alerting sequence is followed if the Forestry Operations Supervisor is unavailable.

Once early warning weather reports have been received and analyzed, the Forestry Operations Supervisor, or an alternate, will notify the District Supervisor, or an assistant, of the nature of the warning and the proposed readiness action to be implemented for the storm. Following the Bureau's call-out procedures, the District Supervisor will then contact Bureau personnel to assure personnel availability as is appropriate to the conditions predicted at the time.

The Forestry Operations Supervisor will also alert the City Hall operator of the impending nature of the storm. This is done to assure efficient handling of incoming calls reporting storm damage. If a major or extensive storm is anticipated, the Bureau of Municipal Equipment Dispatcher's Office is also notified so that the appropriate equipment operators can be programmed in the event it becomes necessary to use them.

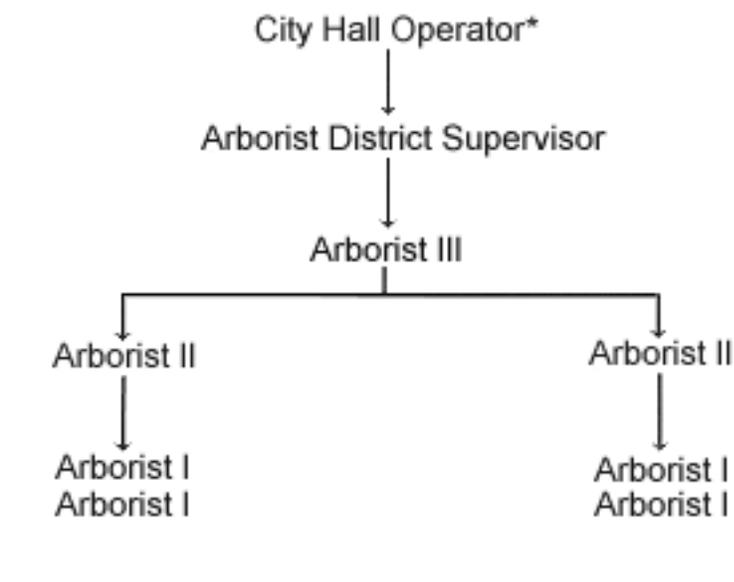
Due to the many variations in storm types and wind conditions, it is often impossible to predict when extreme, locally severe conditions are to occur. Conditions such as tornadoes, limited down drafts and other locally limited high-wind speed phenomena are not generally accurately predicted, and are therefore, more difficult to react to than sustained high winds, ice build-ups, or anticipated frontal approaches. Once warnings have been received, it is critical that storm conditions continue to be monitored to provide the earliest possible alerting of severe or catastrophic conditions.

Immediate Reaction For Large-sized Communities

Minor Storms

Milwaukee's Bureau of Forestry has developed operational procedures for both minor and major natural disasters. By definition, from an operating procedures standpoint, minor storms are those storms in which predicted road blockages, fallen trees and limbs, and large hanging limbs can be properly attended to within the 24-hour period immediately following the storm. Clean up operations, including brush disposal, raking and sweeping, may extend beyond the 24-hour period, but all hazardous situations must have been abated by the end of the 24 hours. Such storms are usually of a magnitude that the Bureau receives from several to 400 damage report phone calls. Additionally, the Bureau relies upon its own resources for immediate damage abatement and debris clean up. Figure 1 illustrates the chain of command for a minor storm.

Figure 1. Milwaukee Bureau of Forestry Tree Division Flow Chart - Minor Storm.



*Author's Note: The City Hall Operator may only be available to take calls during business hours. Communities may need to identify a person to take calls after regular business hours.

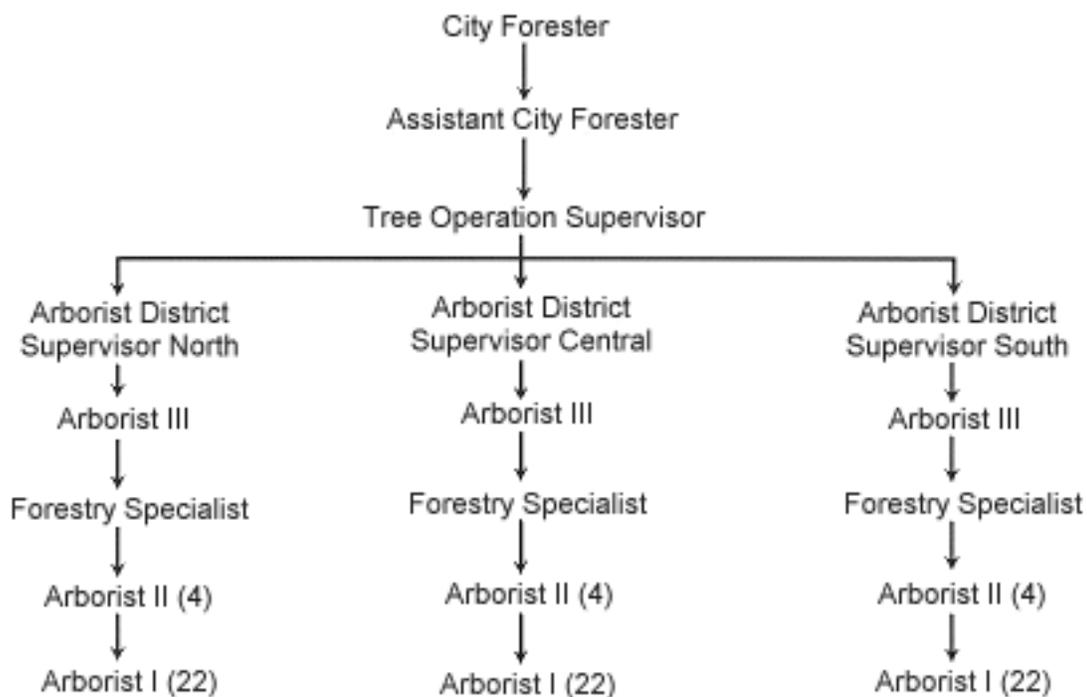
Major Storms

At the major storm level, the extent of the number of calls or the conditions created by the **storm** will require more than 24 hours to abate hazardous tree damaged conditions. Such storms will generally exceed 400 damage report phone calls. Major storms will require coordination of staff and equipment with the Boulevard Division and possibly with other units in public works. Major storms may also necessitate rental of outside equipment and staff from private contractors to effectively and efficiently complete damage clean up. Major storms generally

will have a post-hazard reduction clean up of not less than one week duration, but may be so extensive as to require several months of clean up efforts.

Major storms are rarely predictable as to the extent of the damage that they will cause, because of the nature of the weather phenomena that creates such catastrophic conditions. Escalation from minor to major storm status is dependent on locally severe conditions producing strong gusting winds such as severe down drafts or tornadoes. Figure 2 illustrates the chain of command for a major storm.

Figure 2. Milwaukee Bureau of Forestry Tree Division Flow Chart - Major Storm.



A. Chain of command and major functional responsibilities when a major storm strikes

1. City Forester

- Provides overall direction for the storm-fighting effort
- Makes decisions relative to the escalating nature of storm conditions and reports to the
- Commissioner of Public Works regarding the extent to which outside help from other
- Public Works Bureaus or contractors is necessary
- Reports to the Commissioner of Public Works on the nature and extent of storm conditions and clean up efforts
- Makes decisions relative to abandoning other Bureau functions such

as mowing, nursery maintenance and other landscape care activities, in favor of necessary tree damage clean up efforts

- Serves as immediate contact for alerting the various news media as to the progress and problems encountered in the storm clean up effort
- Provides necessary contact with alderman and other policy makers regarding local damage conditions

2. Assistant City Forester

- Coordinates the involvement of other Public Works Bureaus in the storm clean up effort
- Arranges contracts with outside tree contractors for storm assistance
- Maintains the normal flow of otherwise unavoidable Bureau operations

3. Business Operations Manager

- Supervises, receives and dispatches reports on tree damage
- Locates and procures required supplies and materials for field operations
- Ensures the processing of payments and the expediting of funding for emergency purchase items
- Establishes accounting systems to adequately track costs associated with storm clean up
- Provides additional administrative help as required by the City Forester for field operations

4. Forestry Operations Supervisor

- Coordinates overall field activities in response to storm damage
- Acts as the liaison related to inter-district movement of Forestry employees
- Coordinates and assigns general duties to personnel assisting the Tree Division in clean up
- Makes decisions relative to shift staffing, working hours, and temporary cessation of clean up activities
- Initiates requests for additional personnel and equipment, should the need arise
- Reports to the City Forester on items concerning the intensity of storm conditions and the progress made in cleaning up storm damage

5. Landscape Operations Supervisor

- Directs the coordination of Boulevard Division staff into the Tree Division clean up activities
- Monitors and prepares reports of progress for the City Forester, Commissioner of Public
- Works and the media
- Updates information and prepares progress reports for the City

Forester, Commissioner of Public Works and the media

- Supervises the production of graphic representation of hazard reduction and clean up progress
- Maintains normal and unavoidable day-to-day business activities of the Boulevard Division

6. Forestry District Supervisor

- Supervises all field activities within the district
- Prioritizes and assigns specific work activities to the crews working within the district
- Makes specific assignments to managers from other Divisions or Bureaus working within the district
- Monitors on a continuous basis storm progress and makes personnel and equipment requests as necessary
- Monitors and records time of service for personnel from the Bureau of Forestry,
- Municipal Equipment Bureau and any other Bureau's assisting in the clean up effort

7. Forestry Technical Services Coordinator

- Coordinates the gathering as well as the recording of information regarding property damage resulting from tree failure and Bureau operations
- Supervises one or more individuals in the collection of such data, depending on the magnitude of the storm and resultant private property damages

8. Arborist III

- Calls out District personnel and dispatches crews. Note: Specialized trucks such as articulated boom trucks and chipper trucks will be dispatched first
- Prioritizes and tabulates incoming telephone calls
- Monitors the progress of assigned crews through radio communication
- Periodically checks field conditions to determine the intensity of storm damage
- Assists the District Supervisor to utilize other Bureau's personnel and equipment for systematic storm clean up operations
- Prioritizes follow-up tree removal and repair

9. Arborist II

- Procures equipment necessary to efficiently accomplish clean up activities
- Determines extent of damage and decides necessary action
- Enforces safe work procedures
- Completes appropriate forms for work completed
- Reassigns crews as needed on a priority basis

10. Arborist I

- Must wear all personal safety equipment
- Must practice safe work procedures
- Performs work assigned by supervisor
- Completes appropriate reporting forms when not assigned to work with Arborist 11

B. Call-out procedure

Under major storm situations, all Tree Division personnel will be called out immediately when a determination of major storm status has been made. The Forestry Operations Supervisor will direct the three District Supervisors and the Business Operations Manager to call out all field and administrative personnel to report to their respective job locations. Because rapid response to storm conditions is essential, a calling chain for each district and the administrative staffs is required.

C. Receiving and dispatching calls

All calls regarding storm-damaged trees should be directed to the Forestry Bureau office. Bureau personnel will staff the phones and take all incoming reports of damage. Where massive damage has occurred, it is particularly important to separate high-priority calls which must be promptly handled from those calls which can be delayed anywhere from several days to a week. Therefore, the following information should be routinely gathered from all callers.

1. The name and phone number of the person reporting the damage.
2. The exact location (address) of the damage.
3. The ownership of the tree. is the tree between the sidewalk and the curb, within the boulevard, or on private property?
4. The tree(s) status. is the entire tree broken, or uprooted, or has just a branch broken from the tree?
5. The status of broken parts of the tree. If a branch is broken from the tree, is it still hanging in the tree, or is it at rest on the ground?
6. The diameter of the damaged tree or branch.
7. Any relevant road status. Is the tree completely, or only partially blocking passage of the road?
8. The status of relevant property. Has the damage resulted in the tree failing on a house or an automobile? If the tree has fallen on a house, is it blocking the only exit from the house?
9. An assessment of whether further damage is likely if the situation is not attended to immediately.
10. Proximity to utilities.

The manner in which calls are dispatched to the field will be determined by the magnitude of the storm. In most instances, calls can be dispatched to the Field Offices by phone. However, under extreme conditions or where damage is concentrated in one area, the only calls that should be relayed by telephone to the field are those involving trees blocking arterial streets, trees down and at rest on homes or automobiles, and tree problems of an emergency or life-threatening nature. All other calls will be forwarded via a Bureau Service Request. Service Requests will be picked up by a mail courier service which will provide continual delivery of Service Requests and necessary supplies and materials from the administrative offices to the field offices. Additional deliveries should be made at intervals not exceeding 90 minutes.

Authors' Note: In some situations after a major storm strikes, a community may not collect the level of detail of information as presented in the previous section. For example, the following basic information may be all that is collected from phone calls (Hermann, 1993):

1. Address (will determine if site is along a major artery or a residential street)
2. Presence of utilities
3. Tree on house (immediate safety concern or not)
4. Tree down blocking street or alley (immediate safety concern or not)
5. Tree down on boulevard or in yard (immediate safety concern or not)

D. Priority ranking of storm calls

Under major storm conditions, it is impossible to respond to and service calls on an individual basis. Therefore, only the most critical calls should be serviced in this manner. Priority service would be given to individual calls in the following order:

1. Trees down, injured people caught in car or home. (Note: This call would be received after the caller has called 911 for assistance.)
2. Trees down, blocking arterial streets.
3. Trees blocking exit from individual residences.
4. Trees split or rocking, which have high probability of failing, causing personal injury or property damage.
5. Trees or branches fallen and fully blocking non-arterial streets.
6. Trees fallen and at rest on homes.
7. Trees fallen and at rest on automobiles.

These calls will be handled by crews dispatched on an individual call basis.

Under major storm conditions ' the vast majority of calls will be serviced on a quarter-sectional basis; that is, one quarter section of the city at a time will be serviced, with efforts concentrated in the most severely damaged areas. The first and foremost objective of quarter-sectional clearance efforts is road clearing. Every possible effort should be made to clear non-arterial roads within the quarter sections to ensure the safe passage of emergency vehicles and to minimize the potential for nighttime automobile accidents created by downed trees. Road clearing is the priority operation when concentrating on quarter-sectional storm damage. Once sectional road clearing is completed, the efforts may concentrate on the quarter-sectional correction of broken branches hanging and broken branches down.

The major objectives of the Tree Division during the initial phases of response to a major storm is to clear right-of-ways and pile brush for later pick-up. During these initial phases, a minimum commitment should be made to picking up and disposing of brush. During the initial phases of the storm, clean up activities should be limited to those necessary to alleviate hazardous situations such as blockage of arterial streets, and to facilitate hazard reduction operations.

E. Trees growing on private property

During major storm conditions, Bureau of Forestry activity is extremely limited with respect to trees on private property. Activity will be limited to two options:

1. Fallen trees and debris will be cleared from the City right-of-way.
2. Fallen trees which block exits from homes and business locations should also be cleared to allow access to the buildings.

In both instances, only the minimum work necessary to achieve the clearance goals should be done.

F. Reporting property damage

Under major storm conditions, the reporting of property damage is coordinated by the Forestry Technical Service Coordinator. The Coordinator will serve as a field data gatherer and supervisor of those other personnel involved in property damage reporting. The coordinator should also be in radio contact with field offices and field crews and will respond to reports of property damage. They will also complete on-site evaluations. Photographic documentation of property damage and the tree conditions which lead to them is extremely important. Both black and white and color prints should be used to document such damage. Property damage reports must be filed.

G. Maintaining a log of emergency service activities

The crew performing the emergency tree service work should keep a log on the appropriate forms of those activities performed in conjunction with the storm clean up. Such logs must be uniformly maintained and filed at the conclusion of the storm clean up effort. Information gathered shall include, but not be limited to:

- the location serviced
- the size and species of the tree serviced
- the time that the Bureau completed clean up activities
- the nature of the corrective action taken at the site
- the fiscal amount and extent of property damage, if any
- instructions as to what follow-up work is necessary by the Bureau

H. Clean up activities

The most time-consuming part of any storm response effort is the clean up of downed debris. In order to minimize the time necessary to remove debris from the public right-of-way and also to service the citizens in the most efficient manner, the following steps should be taken during debris clean up activities:

Step 1

The Department of Public Works should immediately issue a press release detailing the magnitude of the storm and the expected clean up time. Additionally, the press release should request that citizens haul all debris from private trees and pile it between the sidewalk and the curb in an orderly fashion with the butt of the branches facing in one direction. The press release should also inform the citizens that the City will pick up the debris on a quarter-section basis.

Step 2

Organize the clean up effort to maximize the use of mechanical advantage. Grapples and Prentice loaders should be routed to areas for handling of heavy wood debris. Each wood handling piece of equipment should be accompanied by between three and five 2-1/2-ton trucks, depending on the travel distance to the debris staging site and the nature of the debris being hauled.

Step 3

The clean up of limbs and other debris which would not be considered large wood

should be accomplished manually. This work will involve traversing every street within a quarter section to clean both public and private debris from the right of way. Manual hauling of brush may be accomplished in one of three ways: the use of chippers and chipping trucks, the use of open hauling or the use of sanitation packers. Crew configurations and assignments should be as follows:

- A. Chipping crews should consist of a chipper truck, chipper, chain saw, one arborist, and two assisting personnel from the Boulevard Division or another Bureau. All debris, both public and private, should be removed by this crew.
- B. Open hauling should be accomplished with the use of a low profile 2A/2-ton dump truck. Each dump truck should be driven by an arborist accompanied by two assistants from the Boulevard Division or another Public Works Bureau. All trucks should be equipped with a chain saw, rake, broom, pitchfork, and shovel. Debris should be manually loaded and hauled to either the dump or the staging site.
- C. Where major and extensive damage warrants, the Bureau of Sanitation will be contacted for assistance in providing brush pickup using Sanitation packers. Packers will be supervised by Bureau of Sanitation supervisory personnel who will report to a Forestry District Supervisor for assignment of quarter sections to be cleared of debris.
- D. To minimize travel time, temporary brush staging sites shall be set up at various points throughout the city. Debris can be hauled and dumped at these sites for later removal to permanent brush disposal facilities. Crews should be instructed as to the location of these temporary sites and instructed to dump their loads at the most geographically convenient permanent or temporary dumping site.
- E. Clean up progress should be monitored by quarter section and should be reported to the progress coordinator (Landscape Operations Supervisor) at the Bureau of Forestry Office at 8 a.m., noon, and 4 p.m. of each day of the clean up effort.

I. Coordination with other bureaus

The City Forester will report to the Commissioner of Public Works regarding the need for clean up assistance from other City Bureaus or Departments. The necessity for using personnel from other Bureaus or Departments will be determined by the Commissioner of Public Works. At such time that it is decided to use outside help, the Assistant Superintendent of the Bureau of Forestry should contact emergency response coordinators from each Public Works Bureau. The extent and nature of the participation of the Bureaus will depend on the magnitude of the storm.

Laborers from the Bureaus of Street and Sewer Maintenance, Bridges and Buildings, and Traffic Engineering and Utilities will assist the Bureau in clean up activities. Crews coming from these Bureaus should be equipped with open 2-1/2-ton trucks with boxes capable of handling brush debris. They should be staffed by not more than two laborers and a Labor Crew Leader. These individuals will be assigned to specific districts and will receive their clean up assignment from the District Supervisor.

The Bureau of Sanitation will assist by supplying packers, packer personnel and supervisors to handle brush clean up. They will be assigned by the Assistant Superintendent of Forestry to operate a specific district. Assignment of quarter sections will be made by the District Supervisor.

Management personnel and technicians from all Public Works Bureaus will be assigned as field progress coordinators checking for completion of clean up activities and for obvious locations of hanging or downed branches.

J. Cost accounting

The Business Operations Manager is responsible for establishing work order numbers against which charges for storm damage clean up will be made. Two work order numbers should be established. The first is to handle emergency storm damage activities including hazard reduction and clean up. The second number will include follow-up repair of storm damaged trees.

The Business Operations Manager is also responsible to assure that the proper inter-departmental requisitions are processed for payment to assisting Bureaus.

K. Forestry Shop functions

Under major storm conditions, the Forestry Shop should discontinue all but emergency services. These services will include the repair and sharpening of chain saws, chippers and hand saws, and other necessary hand tools. Also, the issuing of hand tools, gasoline and oil supplies to field crews will be conducted as top priority.

4.7 Commentary

Both Oak Park's and Milwaukee's early warning and immediate-reaction scenarios are well worth considering for adoption by medium- and large-sized communities, respectively. Though these procedures are specific to Oak Park and Milwaukee,

they are comprehensive, time tested and up-to-date. A municipal government's public works director and urban forest manager should determine how the plans might be adapted to their own municipality. Undoubtedly, local climatological and geographical variations would modify the scenarios.

4.8 Other Considerations

The following items should be considered and planned for in the event of any natural disaster, large or small. For more detailed information on many of these topics, refer to Chapters 6 and 8.

- Debris disposal - Identify stock pile locations, disposal options and resources for chipper trucks.
- Communications - Anticipate a loss of normal methods of communications (telephone). identify alternative methods (cellular phones, 2-way radios, ham radios, etc.)
- Fly-by-Night "Arborists" - Anticipate an onslaught of "tree care experts" to appear after a natural disaster. Provide information to the media to warn home owners about the damage these companies may cause to trees.
- Media - Utilize the media to the fullest extent to share information and update community residents about storm operations.
- Public Service Announcements (PSA's) - Develop PSA's prior to a natural disaster so that they can be released immediately. Possible PSA topics may include:
 - Chain saw safety
 - "Fly-by-Night Arborists"
 - Potential hazards during storm clean up
 - Uses of wood chips
- Documentation - Documentation of urban forestry management practices, in particular, costs and expenditures to the tree resource and tree inventory information, are critical if a community plans to pursue disaster relief funding for the tree resource. (Refer to Chapters 6 and 8 for details.)
- Key Decision Makers - Identify any key decision makers or individuals empowered to make decisions that will impact the tree resource. These people are critical, especially immediately after a natural disaster, because they can make rapid decisions during those chaotic times.
- Non-local people - individuals from State and Federal agencies (Natural Resources and Emergency Management) may come and assist communities after a natural disaster. These people will probably be quite unfamiliar with the area. In anticipation of this, communities should have road and land-use maps available. Additionally, communities may wish to identify local individuals who can serve as volunteer guides when

necessary.

- Clean up Dangers - Residents and business owners will attempt to clear debris around their property. Provide information through the media that identify potential hazards to clean up (live downed wires, trees snapping from weight removal, etc.)
- Tree Removal - Many trees may be assumed to be dead after a natural disaster, and might be removed right away. These trees may possibly survive. Efforts should be made to anticipate this, so needless removals can be avoided.
- Clean up Crew Needs - Recognize that members of clean up crews will need multiple sets of clothing and boots. Conditions after natural disasters may be very wet, and clothing needs will become critical.
- Fuel - Vehicles and equipment should be fully fueled with reserve fuel available prior to a natural disaster.

4.9 Example--The Asplundh Municipal Storm Emergency Procedure

The Asplundh Municipal Storm Emergency Procedure serves as an excellent example of a planning procedure involving a national tree firm. Asplundh's procedure calls for the municipality to complete the following five steps (Asplundh, 1991):

Step 1

Designate someone on your staff to act as the municipal storm coordinator.

Step 2

Call the Asplundh Field Division office in your area (see local telephone directory).

- Make arrangements for emergency activities at the beginning of the contract to call either the manager, supervisor or general Asplundh foreman to avoid confusion and to insure prompt response.
- if the Asplundh contact is unavailable when there is an emergency, call the Asplundh Municipal Storm Coordinator at the firm's Willow Grove Headquarters.
- Give the location and phone number of your storm headquarters.
- Consider the use of alternative forms of communication, such as two way radios or cellular phones, in the event of electrical and telephone service

disruptions.

Step 3

Provide the following information:

- number of crews requested,
- where and to whom the responding crews and foreman should report, and
- other types of assistance required. For example:
 - - tools and safety equipment
 - - roving lift machines
 - - fuel trucks
 - - log loaders
 - - trim lifts to lease
 - - chain saws to lease

Step 4

Asplundh will then:

- set up a local Asplundh storm center with management and support personnel,
- use specialized storm emergency time sheets and crew logs,
- make available special staff and equipment expense billing schedule,
- make arrangements for meals, lodging, and travel for crews, and
- assign a general foreman to approximately five responding crews.

Step 5

Finally, Asplundh will review the storm restoration operation with the municipality after completion of the work in order to make any necessary changes or adjustments for improved future performance.

The foregoing procedures, or one from another national tree expert firm, can be modified to meet the needs and budget of a small community. However, the smaller the municipality, the greater the preparedness and recovery responsibility which rests on the municipal chief executive officer, namely the mayor, town (or village) president, or manager.

4.10 For More Information

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Appendices:

[Appendix A--When a Storm Strikes](#)

[Appendix B--Ice Storm Damage to Urban Trees](#)

[Appendix C--Flooding and its Effects on Trees](#)

[Appendix D--Helping Trees Weather Nature](#)

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Chapter 4

Appendix A

Bulletin No. **2**
James R. Fazio, Editor



When a Storm Strikes

*It is a marvel that trees
should live to become the
oldest living things.
Fastened in one place, their
struggle is incessant and
severe. From the instant a
tree casts its tiny shadow
upon the ground ... it is in
danger.*

*-Enos A. Mills, Naturalist c.
1910*

**Except for the incessant
mistreatment by humans,**

never is danger to a tree greater than during the inevitable trial by storm. The pounding of rain or hail and the fury of wind test the strength of limbs, trunk and roots. The homeowner, helpless at the moment, can only watch and hope that the tree survives. Survival or loss - the key can be the care you give your tree *before* and *after* a storm. Knowing ahead of time what to do when a storm strikes can also prevent or minimize your financial loss.

It was one of those storms that was so close there was no pause between the flash of lightning and the deafening clash of thunder. No one on Linwood Avenue slept through this storm, and a light came on here and there to help ward off the fright of wind and rain beating noisily against bedroom windows.

In the morning, anxious residents looked out to survey the damage. In some yards, only a limb or two lay on the lawn. In others, familiar views were altered forever. Some trees were split, with half their crowns bent to the ground like peeled bananas. Here and there a whole tree lay prone with its roots exposed and limbs tangled amid gutters and wires. Out on the street, branches littered



the sidewalks and children were already gathering to play on an old maple that lay like a fortress across the avenue.

In some areas, such as south central Florida, thunderstorms like this one stalk the countryside up to 100 days each year. On the Pacific coast, five in a year may be surprising. In the midwest and middle Atlantic states, ice storms - especially in autumn while leaves are still on the trees - add to the endless struggle. Frequent or rare, mild or severe, storms are an inevitable fact of life. This bulletin is dedicated to the people who care about trees minimize the impact of storms on our community forests.

An Ounce of Prevention...

The old ounce of prevention. Above all else, this is the best way to protect trees from storm damage. The keys to prevention are:

- Think ahead when planting trees. Visualize the young tree when it is mature and avoid planting it near wires, too close to a building, or in spots where it will be in danger of blowing over (such as on the edge of a bank). Planting in groups, or planting species with naturally deep root systems can also help prevent trees from being blown down.
- Avoid planting brittle species on sites where breakage will cause problems. Examples include:
 - Elms
 - Poplars
 - Willows
 - Silver maple
 - Box elder
- Where early ice storms are common, avoid planting species that hold their leaves late into the fall.
- During sidewalk replacement or other excavation, avoid cutting roots, or keep root damage to a minimum.
- Beginning when they are young, prune trees to prevent development of weak form (See *Bulletin No. 1*).
- Annually prune dead or weakened limbs, and occasionally thin excess branches from the crown. The goal is to produce a well-shaped tree with the center of gravity squarely over the trunk and a crown that lets wind pass through rather than catching it like a sail.
- For particularly valuable trees, a professional arborist can strengthen tree crowns by installing flexible cabling and/or rigid bracing. This will allow the tree to function more as a single unit, with major limbs supporting each other.
- Keep trees healthy and vigorous by watering, fertilizing, and protecting the sod from compaction.

Removal of hazardous trees is also part of prevention. Under the law, tree owners are required to recognize

dangerous conditions and correct them. Property owners can be held liable for injuries or damage to the property of others if they fail to remove a tree that falls under reasonably foreseeable circumstances.

Lightning Protection

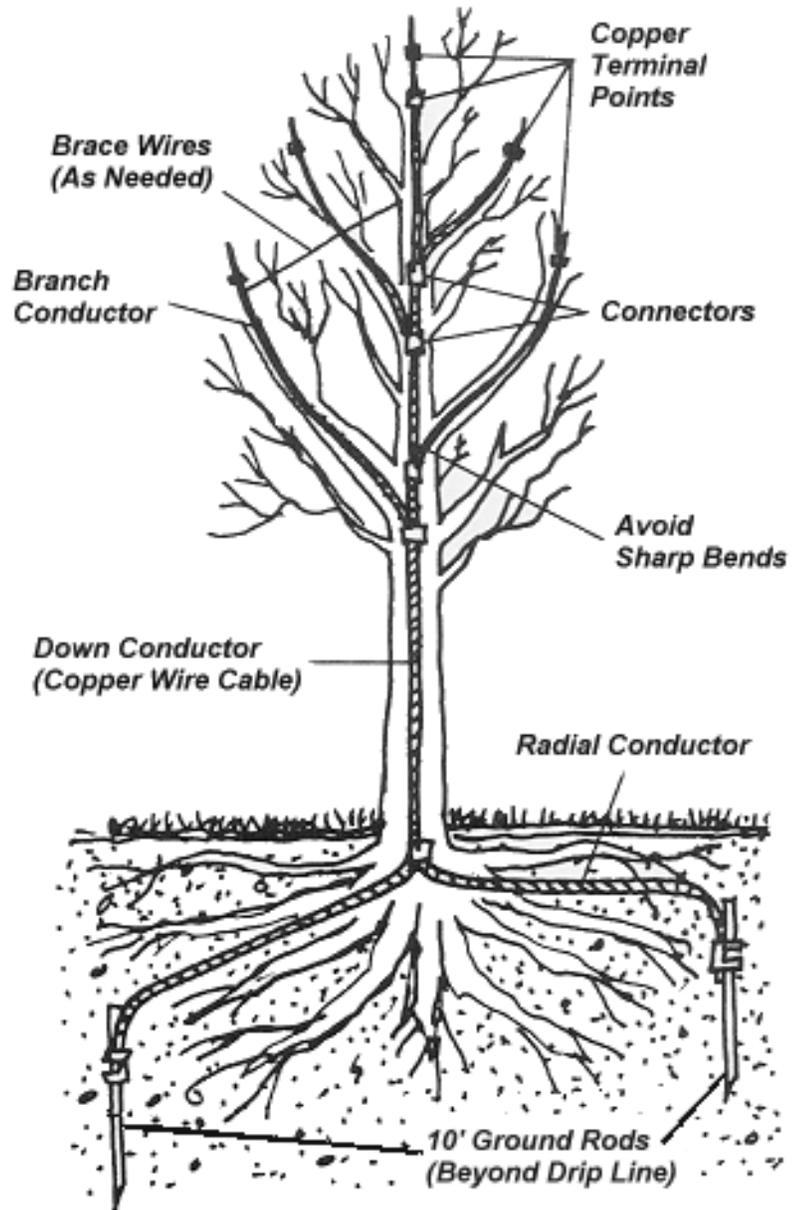
A lightning protection system is one way to protect mature trees that have high value. This might include a historic tree or one that occupies a particularly important place in your landscaping. Trees that are used by people for shelter in a storm should definitely be equipped with a protection system, and tall trees within 10 feet of a building are good candidates.

The protection system consists of copper or aluminum conductor wires that run from the top of the tree (and sometimes from major lateral branches) into the soil and end at ground rods driven 10 feet beneath the surface. Detailed installation instructions must be followed and careful annual inspections are necessary to make sure that all strands are intact. Extension of the treetop terminals is usually necessary every few years as the tree grows. Lightning control devices should be installed by professionals.

For details, write for:

Lightning Protection Code
National Fire Protection Assoc.
Batterymarch Park
Quincy, MA 02269

*Lightning Protection Installation
System Standard*
National Arborist Assoc.
P.O. Box 1094
Amherst, NH 03031-1094



The Morning After...



On Linwood Avenue there was considerable confusion after the storm. Neither the residents nor the city forestry department were well prepared for handling the damage. As a result, trees were removed that could have been saved, some were left weakened and became dangerous or had their life spans significantly shortened. With poor advice and the services of fly-by-night tree "experts," many residents lost money as well as the beauty and practical benefits of their shade trees. Here are some ways to be prepared for when a damaging storm strikes your street.

1. Assessing the Damage

The first step is to assess the situation and decide what needs to be done - and by whom. immediately notify police of any wires that are down on *sidewalks* or the street. Stay away, and *keep other people* away! In case of tree damage on your property, notify the phone or electric company of any problems with wires - and do not try to correct the situation *yourself*

If street trees are the responsibility of the municipality, report damage to the department that handles tree care. Check to see if they will remove the downed branches of privately owned trees if brought to curbside.

For removal of downed trees or repair of damaged ones, decide if you want to do the work or hire someone to do it for you. Tree work can be extremely dangerous and a tree care company should be used especially when:

DANGER SIGNS



- a tree is large and requires high climbing or the use of a chain saw.
- the tree is partially down ~for example, leaning on a structure or entangled with another tree).
- wires are involved or structures are endangered.
- major repair of the tree is necessary, such as cabling or bolting a split fork.
- large limbs are split or broken but still attached to the tree.
- you do not have the proper tools, knowledge, or health to do tree work.

2. Selecting a Professional

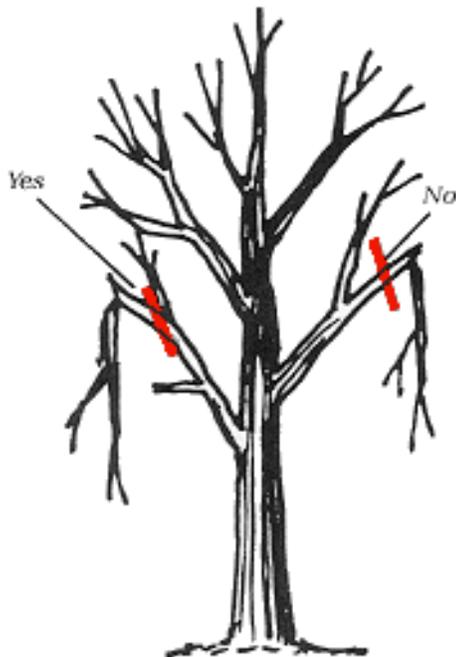
After a storm, it is common in some areas for people to show up at your door offering their services to remove or repair trees. As one urban forester warned, "They seem to come out of the woodwork - people we have never even heard of before." Do not be a victim. Make sure you use only professionals who:

- are part of established businesses in the community or nearby areas, and who are working for the company rather than moonlighting.
- have a listing in the phone book, usually under Tree Service.
- are fully insured for property damage, personal liability and worker compensation.
- ideally, are members of a professional association of arborists.

It is also wise to get more than one estimate when possible. in case of removals, have a clear understanding about who removes the limbs and debris from the property, and whether or not the price includes stump removal and clean-up. Your tree will have value as firewood or chips, either to yourself or if sold to others, and should be considered in the estimate.

Repairing the Damage

How To Prune Storm-Damaged Trees



Cutting flush against a larger limb or the trunk was once believed to be the best way to prune. We now know that such a method is improper because it weakens a tree's natural defense against the invasion of disease organisms. The possibly harmful effects of pruning wounds can be minimized by making all cuts just to the outside of the raised areas at branch intersections. These features are called bark ridges (above) and branch collars (underneath).

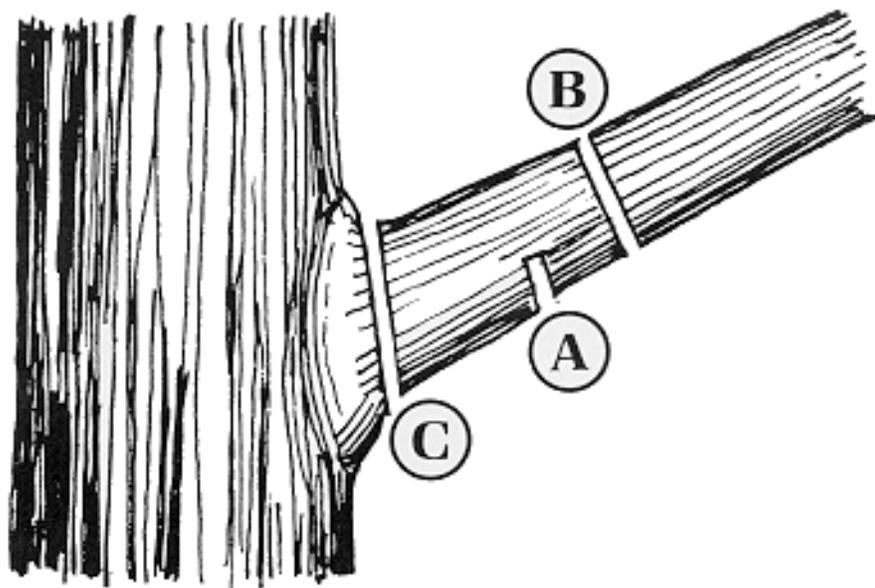
Removing the jagged remains of broken limbs is the most common repair that homeowners can make after a storm. It is also an important task because, if done properly, it will minimize the risk of decay pathogens entering the tree. Following good pruning techniques, cut off limb stubs where they join the next largest branch or the trunk. Do not simply cut immediately below the break.

Because of its weight a large limb could tear loose during pruning, stripping bark and creating jagged edges that invite insects and disease. That won't happen if you follow these steps:

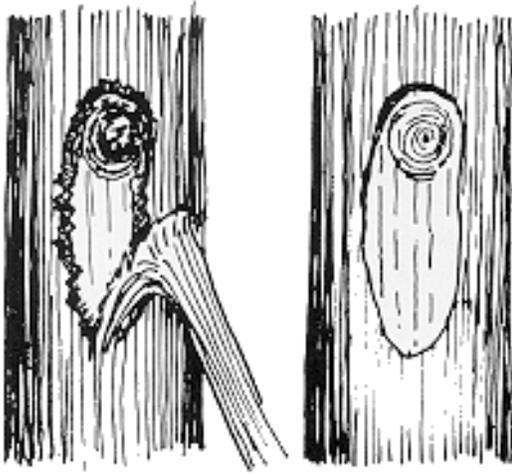
A Cut part way through the branch from beneath at a point one or two feet from the trunk.

B Make a second cut on the top of the branch, several inches out from the first cut. This should allow the length of the limb to fall from its own weight and be safely removed.

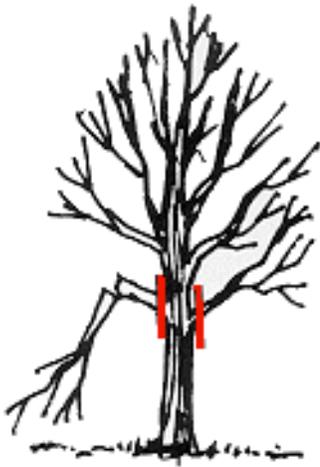
C Complete the job by making a final cut next to the trunk, just outside the branch collar, with the lower edge farther away from the trunk than at the top.



How To Repair Torn Bark



Torn or stripped bark is the result of limbs being violently broken from the tree by wind or branches falling from above. To improve appearance and eliminate hiding places for insects, carefully use a chisel or sharp knife to smooth ragged edges of dead or dying bark. Remove the bark back to the point at which it is attached to the tree. Try not to expose any more cambium (inner bark). Shaping the tear into an ellipse has more aesthetic value than effect on wound closure, and if you do use this traditional method, round the ends to prevent dieback of the cambium at these points. Keep the wound as narrow as you can to hasten wound closing.

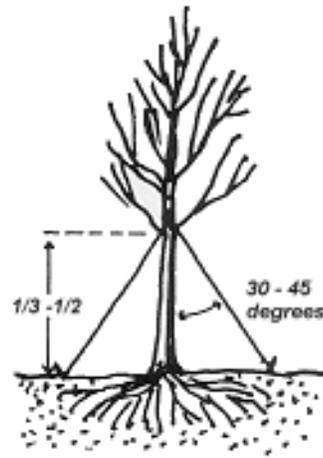
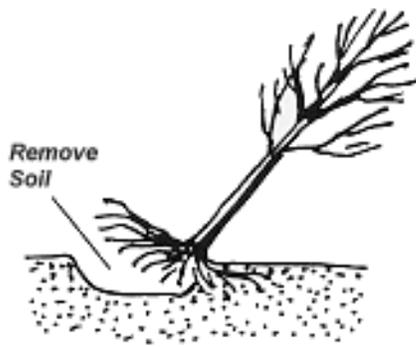


Balance

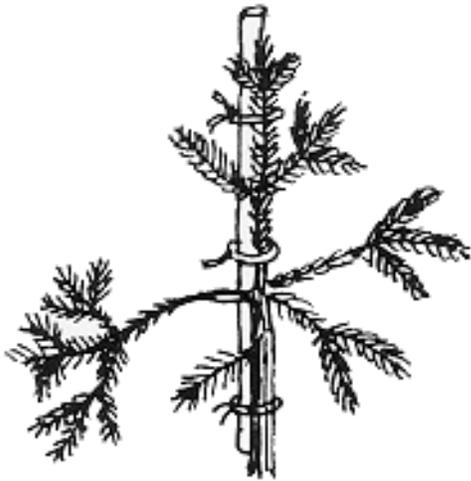
For aesthetic reasons and sometimes to maintain a good center of gravity, look for limbs to remove that are opposite broken one

Partially Uprooted Trees

Young or small trees (under 25 feet in height) that are partially blown over can often be saved. First, remove soil on the uprooted side so the root mass can fit into the hole. Straighten the tree with power equipment, winch or 'come-along', being careful not to break additional roots, and to protect the bait where the rope or cable is attached. With the tree upright, replace soil and anchor in place using 2-3 guy lines attached to a point 1/3 to 1/2 the height of the tree. Tamp and water well to remove air spaces around the replaced roots.



Broken Conifers

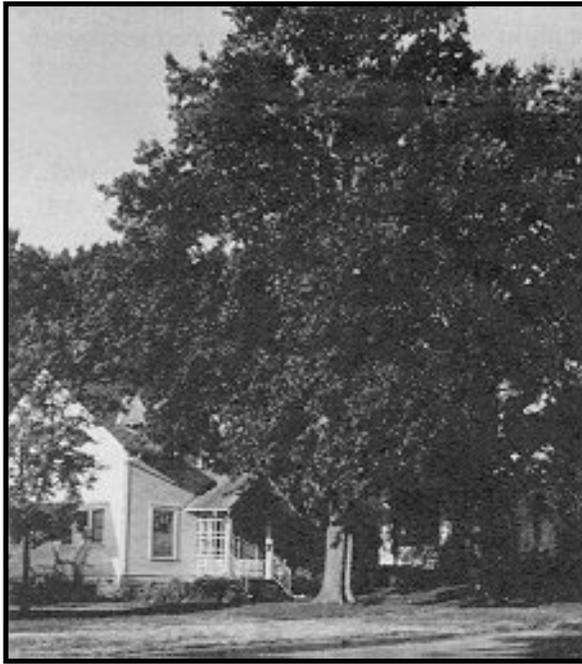


Occasionally the top of a young conifer will be broken by falling trees or limbs. You can restore form to your tree by helping a branch in the top whorl become the new leader. Select the best, and perhaps longest, and carefully bend it upward. Tie it to a pole that is securely fastened to the trunk. Check every few months to make sure the ties are not cutting into the new leader, and remove the pole in 2-3 years.

What About Lightning Damage?

Except for removing hazards, major work on a tree struck by lightning should be delayed 6-12 months. It sometimes takes mortality at least that long to occur, so major expenditures before then would be wasted. The tree can appear perfectly healthy until it suddenly succumbs, often due to a damaged root system.

The effects of lightning are highly variable, sometimes killing the tree almost instantly, and at other times causing no damage. First aid for the tree consists of pruning for safety, fertilizing (to stimulate root growth), and watering. When it appears the tree will survive, more careful pruning, wound repair and continued fertilization (with deep watering, if necessary) is recommended.



This tree was struck by lightning several years ago. It is healthy and the wound is healing. Another tree with a similar-appearing injury might have died.

Storms: The Urban Forestry Response

When asked about the effects of a storm on an urban forestry department, a forester said wistfully "in a matter of minutes we have gone from being caught up on our pruning to suddenly facing two years worth of work."

It is important that the community have an overall catastrophe plan in which the city forester plays an active role.

Before

A municipality's best response to a storm is before one strikes. There are several procedures that can ease the burden of clean-up and even convert the negative effects of a storm into positive care for the, community forest. Here are some methods that have worked successfully:

- Make arrangements in advance for assistance from contractors, Purchase orders or contracts for "as needed" storm services can prevent delays and misunderstandings during the emergency Agreements can be made with contractors known to do quality work, and action plans can be discussed prior to the sometimes stressful conditions of storm clean-up. It is a good idea to insist that contractors carry at least \$500,000 of liability insurance and that employees are fully covered by workers compensation.

- Develop mutual aid agreements with nearby communities. often one area is hit hard by a storm while others are left unscathed. Through a mutual aid agreement, a community that is missed by the storm provides workers and equipment to aid the stricken area and work under the direction of the local forester

After

After a storm, removal or repair of hazardous trees takes priority. Then, it is best to give all damaged trees a partial pruning, returning as work schedules allow for a more complete pruning. In all cases, crews should be reminded to work safely and to adhere to good pruning techniques rather than doing a poor job rapidly.

- Take advantage of "the teachable moment." Arborists often struggle to get the attention of the public to promote good tree practices, but find it difficult. When a storm strikes, trees suddenly enter the spotlight of news. The news media will be hungry not only for "hard news" about the storm and its effects on the community, but will also use *sidebars* - related vignettes or short features. Use this opportunity to educate citizens about tree physiology, proper pruning, how to select and work with a professional arborist, preventing future storm damage to trees, how to plant a new tree, avoiding planting large trees under power lines, and similar topics.
- Create good public relations out of a bad situation by clearly demonstrating your concern for the plight of local residents. Two good ways are to provide curbside pick-up service for downed branches (perhaps also providing phone numbers of volunteer groups who would help with yard clearing for handicapped or the elderly), and making chips available free for mulch. Chip trucks can place the piles at convenient locations like neighborhood parks. Publicize these and other emergency services through the mass media and telephone operators in your budding. Also notify police dispatchers and others who are contacted by the public with inquiries.

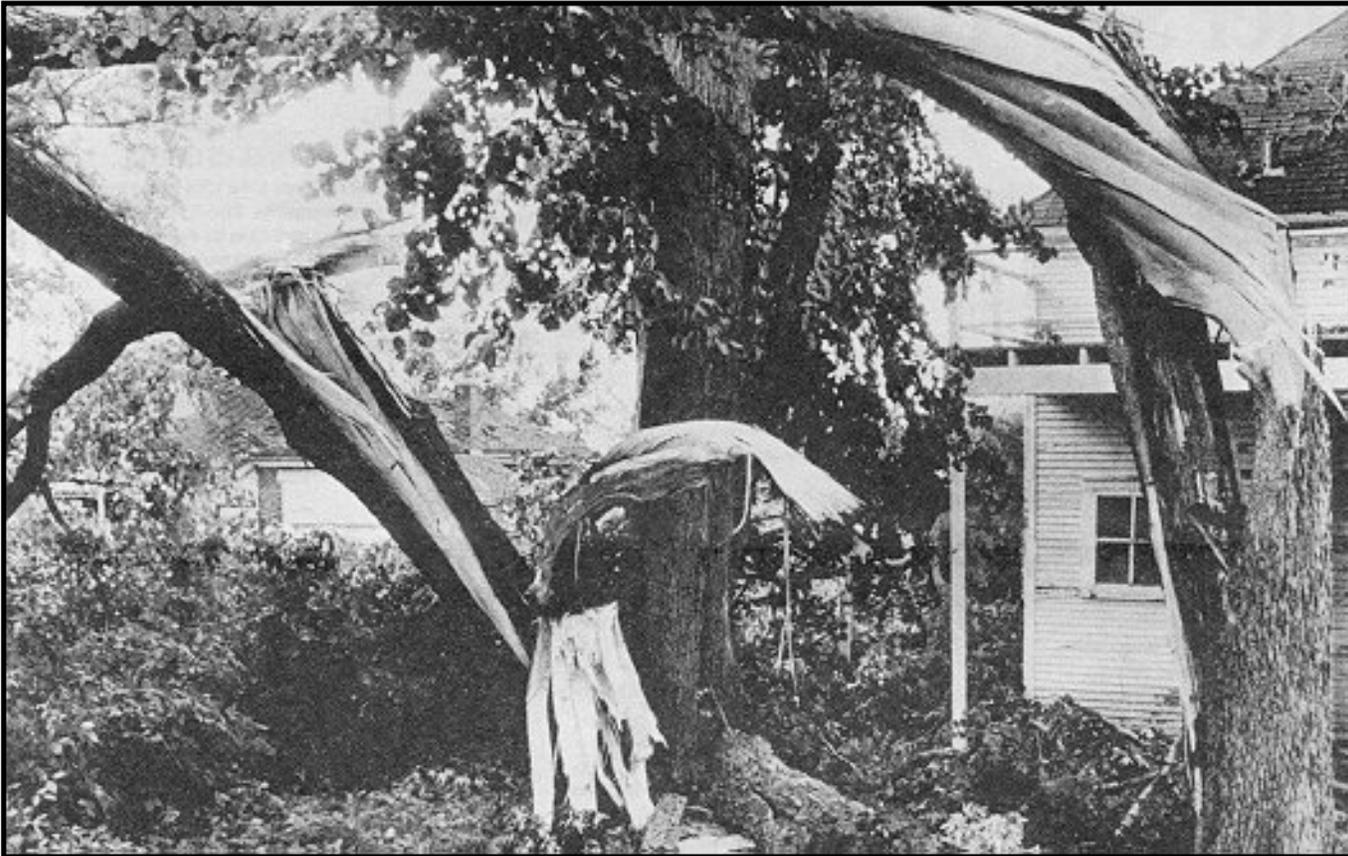
Preparing Your Trees

Storms can create a major impact on municipalities, which is one good reason for having a preventative tree maintenance program that includes:

- careful species selection for street and park plantings (for example, avoiding brittle species).



- rotations to prune all trees on a 3-5 year cycle (with attention to developing strong branch structure and thinning the crown).
- annual inspection to identify hazard trees, with removals as necessary.
- avoiding trenching near trees (this cuts important anchoring roots). Tunnel under the tree instead.



Working With the Media

A few principles will help you work successfully with the media to help assure accurate information and good public relations after a storm.

- Be honest and helpful. Don't try to avoid reporters. Answer their calls promptly so they can meet their deadlines and so they get the expert information they need. Say you "don't know" when necessary, but otherwise answer all questions or refer them to the proper person (with name and phone number) who can give the information. Go out of your way to be helpful to media personnel.
- Immediately develop a fact sheet. Place copies of it by your agency's phones and give them to all personnel who may be contacted by the media for interviews. include in checklist format such things as estimations of damage, number of crew on the job, what equipment is being used and where it is working, emergency services available, dangers the public should know about, suggestions for homeowners, and other information deemed important. Update the information several times a day. A form for this purpose can be printed in advance.
- Have handouts ready. During the off-season, spend some time preparing a kit of information about the urban forest, Tree City USA, and short articles about tree care or emergency clean-up. Provide these to reporters after a storm. They may not use it the way you wrote it, but most will appreciate it and use some part of it. it is a "win-win" situation because it makes the reporter's job easier, it gives information to the public during the teachable moment when people are interested and receptive to it, and it gives you the chance to get factual material to large numbers of people at little or no cost.
- In some communities it may be necessary to initiate the contact with the news media to offer your services in providing information about the storm. Be sure to contact and treat equally all newspapers, radio stations and television stations. Explain who you are and the kind of information you can provide.
- Keep a clipping file for use in annual reports and as one more way to describe the impact of your program to municipal officials. Also keep a list of reporters as you get acquainted with them. Later, contact them and suggest taking them along with you sometime during a regular work day to get a better look at the community's urban forestry program. Some nice feature articles throughout the year will go a long way toward creating a good public image as well as providing residents with the kind of tree care information that will help minimize damage from future storms.

Other Sources of Information or Help

Tree City USA Bulletin will inform readers of helpful, up-to-date publications which provide more depth or that are readily available for community distribution. The editor welcomes sample copies to consider for inclusion in future editions.

BOOKS

- *Public Relations and Communications for Natural Resource Managers*
James R. Fazio and Douglas L. Gilbert
Kendall/Hunt Publ. Co.

P.O. Box 539
Dubuque, IA 52004

or

Society of American Foresters
5400 Grosvenor Lane
Bethesda, MD 20814

399 pp., comprehensive reference to help foresters successfully communicate with their publics. Includes principles, theory and specific techniques, including emergency information services. \$29.95; discount to members available through SAF.

A companion correspondence course for 2 college credits is available through: Correspondence Studies, University of Idaho, Moscow, ID 83843.

LEAFLETS AND BOOKLETS

- *Tree Wound Response and Treatment*
Paul H. Wray and Laura E. Sweets
Cooperative Extension Service
Iowa State University
Ames, Iowa 50011

4 pp., notebook format. Provides excellent explanation of new concepts of pruning, wound treatment, bracing and cavity treatment resulting from Dr. Shigo's work on decay in living trees. First copy free: then 25 cents. inquire about quantity prices.

NEWSLETTER

- To obtain a free subscription to The Urban Forestry Forum, write: American Forestry Association, PO. Box 2000, Washington, D.C. 20013

VIDEOTAPE

- Proper Tree Pruning
Alabama Forestry Commission
513 Madison Ave.
Montgomery AL 36130

A 20-minute video in 1/2" VHS format. It contains a wealth of information about pruning and is presented in an interesting way that would be valuable to all property owners and new tree department employees. Not available for loan, but copies will be provided free if you send a videocassette and self-addressed mailing label.

To order additional Bulletin copies ...

Friends of Tree City USA members may obtain a single copy of any Tree City USA Bulletin free of cost. Quantities of any issue are available at 25 for \$6.25 or 500 for \$100. To order; specify the issue number and quantity, and make your check payable to: The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410

The Bulletins available are:

- No. 1 *How to Prune Young Shade Trees*
- No. 2 *When a Storm Strikes*

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For the Friends of Tree City USA



The
National
Arbor Day
Foundation

100 Arbor Avenue
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The Tree City USA program is sponsored by The National Arbor Day Foundation in cooperation with the U. S. Forest Service and National Association of State Foresters. To be named as a Tree City USA, a town or city must meet four standards:

Standard 1: A Tree Board or Department

Standard 2: A City Tree Ordinance

Standard 3: An Annual Community Forestry Program

Standard 4: An Arbor Day Observance and Proclamation

Each winning community receives a Tree City USA flag, plaque, and community entrance signs. Towns and cities of every size can qualify. Tree City USA application forms are available from your state forester or The National Arbor Day Foundation.

Return to: [Chapter 4 - Natural Disaster Alert, Response, and Recovery](#)

Chapter 4

Appendix B

ICE STORM DAMAGE TO URBAN TREES

by **Richard J. Hauer, Weishen Wang¹, and Jeffrey O. Dawson**

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Abstract. A damage survey of parkway trees in Urbana, Illinois was made to determine critical removal and repair needs of trees immediately following a severe ice storm. Siberian elm, honeylocust, Bradford pear, common hackberry, pin oak, sycamore, green ash, and tuliptree were among the 25 major parkway tree species that sustained considerable ice damage. Larger diameter trees with broader crowns incurred most of the ice damage. Fine branching pattern, structural weakness, and higher degrees of lateral branching were associated with greater incidence of ice damage. No discernible overall relationship existed between wood specific gravity, modulus of rupture, or modulus of elasticity and susceptibility to ice damage.

Ice storms, also referred to as glaze storms, are regional climatic events that vary considerably in frequency and severity (1, 14). During ice storms, supercooled rain falls and freezes on contact with surfaces at or below the freezing point (3).

Accumulations have been observed to increase branch weight of trees up to 30 times (1,14,22,26). Ice accretion generally ranges between a trace to 1 inch in additional diameter (3). Accumulations between 1/4 and 1/2 inch can cause small branch and faulty limb breakage, while 1/2 inch to 1 inch thick accumulations can cause conspicuous breakage (18). Branch failure occurs when loading exceeds wood resistance or when constant loading further exacerbates a weakened area in a branch (24). Strong winds increase the potential for damage from ice accumulation (7,14,18,23).

Ice storms occur on a yearly basis in some regions (18). Between 1900 and 1960 in Illinois, 92 ice storms were recorded (8). In Illinois, the central region of the state has the greatest frequency of ice storms and the majority occur between December and March (23).

Previous reports on ice-storm damage to trees have been derived by comparing damaged forests to surrounding, similar undamaged forest stands (27), observation of a set number of damaged or undamaged trees in forested stands and urban areas (9, 10,22), sampling damaged areas (2), or measurement of macro-litter accumulation on the forest floor (3). In this study a complete street tree inventory had been taken less than two years prior to an ice storm. Direct comparison of an ice storm damage survey with the pre-storm inventory allowed for determination of urban tree susceptibility to ice storm damage. The purpose of this paper is to describe patterns of ice damage to city trees in Urbana resulting from this intense ice storm. Knowledge of ice storm occurrence and impact on trees can be used to develop plans for emergency situations caused by ice storms and for planning to obtain ice-damage-resistant tree populations in urban areas.

Description of storm. On February 14,1990 a winter ice storm occurred in Champaign-Urbana. It was one of the most severe ice storms in recent decades. Rainfall was recorded at 1.8 inches during the 10-12 hour period according to the records of the Illinois State Water Survey in Urbana. Ice accumulations between 1/2 and 3/4 inches occurred on exposed surfaces. Winds were 4 mph and from the northeast.

Damage to trees, powerlines, and property was extensive. More than 18,000 homes in Champaign-Urbana lost their power for as long as 8 days due to breakage of ice loaded power structures and damage to these structures resulting from failure of tree stems and branches.

Inventories. A complete street tree inventory for the city of Urbana had been taken in 1988. Tree species; location; diameter at breast height (dbh) at 4.5 feet; condition including root, trunk, and branch injury; disease or insects, crown

development and branch structure; physical structures; and tree suitability were measured. Tree value was calculated according to 1988 guidelines of the Council of Tree and Landscape Appraisers (CTLA) (17).

A street tree damage inventory was made by the City of Urbana Arbor Division after the 1990 ice storm. Tree location, species, and major damage requiring immediate removal or repair as well as minor damage were recorded at that time. A December 1989 inventory update was used to establish the pre-storm population. Public trees present in the 1989 update sustaining severe damage requiring immediate removal or repair because they were hazardous were used in this analysis. Scientific nomenclature for common names used throughout this paper can be found in Appendix 1.

Results and Discussion

There were 10,713 parkway trees in the city of Urbana according to the 1989 update. There were 24 species of gymnosperms and 123 species of angiosperms. At least 26% (2884 trees) of the street trees were damaged by the storm. Of these trees, about 17% (489 trees) required immediate removal or repair because they were severely damaged and hazardous to life and property (Table 1). These severely damaged trees represented 4.6% of the population. From the damage survey, in addition to the 489 severely damaged trees, 67 trees which were either private trees or public trees such as park trees not accounted for on the 1988 inventory required removal or repair to eliminate public right of way hazards. Only 46 of the 147 parkway tree species in Urbana sustained damage requiring immediate attention.

Table 1. Amount of severe damage to trees resulting from a major ice storm by species and dbh class ranked in decreasing order of damage severity.

Tree species*	Initial number by dbh class (in)				Percent removed by dbh class				Percent repaired by dbh class			
	<13	13-24	>24	total	<13	13-24	>24	total	<13	13-24	>24	total
Siberian elm	48	134	180	362	8.3	33.6	36.1	31.5	10.4	6.7	12.8	10.2
Honeylocust	155	196	10	361	3.2	3.6	0.0	3.3	5.8	12.2	10.0	9.4
Bradford pear	205	1	0	206	7.3	0.0	0.0	7.3	1.5	0.0	0.0	1.5

Hackberry	106	191	90	387	1.9	7.3	5.6	5.4	0.0	0.5	13.3	3.4
Pin oak	39	137	62	238	0.0	0.0	3.2	0.8	0.0	5.1	17.7	7.6
Sycamore	32	258	132	422	0.0	0.4	0.8	0.5	0.0	5.8	9.8	6.6
Green ash	181	80	29	290	1.1	3.8	0.0	1.7	0.6	11.3	17.2	5.2
Tuliptree	58	172	26	256	1.7	1.2	0.0	1.2	0.0	5.8	15.4	5.5
White ash	182	85	73	340	1.1	3.5	0.0	1.5	1.1	3.5	13.7	4.4
Silver maple	224	502	302	1028	0.0	0.6	1.3	0.7	0.0	1.6	8.3	3.2
Bur oak	52	8	4	64	1.9	0.0	0.0	1.6	0.0	0.0	25.0	1.6
Bald cypress	82	8	2	92	0.0	0.0	0.0	0.0	2.4	0.0	0.0	2.2
Norway maple	189	109	10	308	1.6	0.9	0.0	1.3	0.0	0.0	20.0	0.6
Sugar maple	872	352	196	1420	0.3	0.3	1.0	0.4	0.0	2.3	6.6	1.5
Black walnut	25	22	9	56	0.0	0.0	0.0	0.0	0.0	0.0	11.1	1.8
Red maple	672	82	14	768	0.4	1.2	0.0	0.5	0.4	2.4	7.1	0.8
Am. Sweet gum	157	171	5	333	0.6	0.0	0.0	0.3	0.0	1.8	0.0	0.9
L'leaf linden	379	66	0	445	1.1	0.0	0.0	0.9	0.0	0.0	0.0	0.0
White oak	125	5	4	134	0.0	0.0	0.0	0.0	0.0	20.2	0.0	0.7
N. red oak	416	52	8	476	0.0	0.0	0.0	0.0	0.0	0.0	37.5	0.6
Ginkgo	106	6	0	112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Swamp wt. oak	85	2	0	87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arborvitae	67	0	0	67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Silver linden	61	0	0	61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kentucky coffee	52	6	0	58	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other damage (21 taxa)	269	95	70	434	4.8	2.1	1.1	3.2	0.4	4.2	17.1	3.9
Undamaged taxa (101 taxa)				1908								
Totals				10713				2.1				2.5

*Species listed are the 25 most abundant on Urbana city parkways.

Eighty five of the severely damaged city trees were in the 12 inch or less dbh class, 187 were in the 13-24 inch dbh class, and 217 trees were greater than 24 inches dbh. Severe damage was sustained by 1.3% of trees 12 inches dbh or less, 6.5% of the 13-24 inch dbh class, and 17.1% of the 24 inch or greater dbh class. A high proportion of angiosperm trees of larger stem diameter, with broader crowns, and often with structural weakness suffered serious damage.

The total value of trees prior to the storm was \$13,780,277. Severely damaged city trees were valued at \$1,109,413, including \$290,796 for trees requiring immediate removal, \$796,548 for trees requiring immediate repair, and \$22,069 for trees in an intermediate state (Table 2). The value for the removed and repaired trees represents the actual value, as derived by CTLA methods (17), of the damaged trees rather than costs associated with repair or removal. Documentation of damages was used to obtain funding from the Federal Emergency Management Agency to cover losses from the ice storm.

Table 2. The pre-storm value of trees that were severely damaged by an ice storm, in dollars.

Tree species	Removed	Repaired	Other	Total
Norway maple	4,888	7,254	0	12,142
Red maple	7,465	17,253	0	24,718
Sugar maple	12,686	125,519	300	138,506
Silver maple	9,420	53,899	0	63,319
Hackberry	62,957	111,845	3,146	177,948
White ash	8,204	39,133	4,240	51,578
Green ash	8,713	42,138	1,368	52,219
Honeylocust	15,045	53,695	0	68,714
Am. Sweetgum	684	7,713	0	8,397
Tuliptree	6,217	70,928	0	77,144
Bradford pear	9,180	600	600	10,380
Sycamore	5,371	75,285	0	80,657
White oak	0	7,695	0	7,695
N. red oak	0	19,557	12,215	31,772

Bur oak	7,133	600	0	7,733
Pin oak	8,291	69,538	0	77,829
L'leaf linden	1,700	0	200	1,900
Baldcypress	0	400	0	400
Siberian elm	120,495	37,139	0	157,633
Black walnut	0	4,122	0	4,122
Other (21 taxa)	2,347	52,234	0	54,581
Totals	290,796	796,548	22,069	1,109,413

*Trees in "other" column were marginal between requiring immediate removal or repair. Small discrepancies in table are due to rounding errors.

Gymnosperms. Little damage occurred to gymnosperms. Only 3 narrow-leafed conifers, 1 jack pine and 2 bald cypress trees, or 0.6% of 501 total conifers growing on Urbana parkways were injured during the storm. Conifers have been observed to resist ice storm damage (1,10,12,14,18,22). However, conifers are not immune to ice storm damage. Pines including eastern white, Virginia, table-mountain, and pitch pine have been damaged severely by ice storms (18,26,27).

Most narrow-leafed conifers have an excurrent branching habit (13). This form features a dominant central leader and short, horizontal branches which may support their weight against gravitational torque greater than branches which approach the vertical position (15). The typical branch habit and the conical crown of conifers may allow them to resist ice damage.

No parkway arborvitae and few baldcypress trees were damaged by the ice storm. Hundreds of arborvitae trees approximately 25 feet tall in an Urbana windbreak suffered little damage from the storm. There are other reports of the apparent resistance of arborvitae and baldcypress to ice storm damage (9,10,12,22).

Ginkgo was not severely damaged. The majority of ginkgo trees on the parkway were between 2 and 8 inches dbh and the small size may have precluded severe ice storm damage. However, there was little damage to larger ginkgo elsewhere in Urbana. One earlier report indicated that ginkgo resists ice storm damage (26).

Angiosperms. Deciduous angiosperm trees, most of which have a decurrent branching habit (13), seem to be generally more susceptible than conifers to ice storm damage (1,7,12). In Urbana, 486 of the 10,100 angiospermous trees (4.8%) suffered severe damage (Table 1).

Of the 25 major street tree taxa in Urbana, the angiosperms sustaining the most severe damage from the ice storm were Siberian elm (41.7%), honeylocust (12.7%), Bradford pear (8.8%), common hackberry (8.8%), pin oak (8.4%), sycamore (7.1%), green ash (6.9%), and tuliptree (6.6%). Trees sustaining intermediate damage include white ash (5.9%), silver maple (3.9%), and bur oak (3.1%). Angiosperms least damaged include Kentucky coffeetree (0.0%), swamp white oak (0.0%), silver linden (0.0%), northern red oak (0.6%), white oak (0.7%), littleleaf linden (0.9%), American sweetgum (1.2%), red maple (1.3%), black walnut (1.8%), sugar maple (1.9%), and Norway maple (1.9%).

Siberian elm is a brittle, fast-growing species with rough bark and a fine branching pattern which tends to accumulate more ice than trees with less branch surface area. This tree species sustained the greatest damage in Urbana and also in an ice storm in Colorado (4).

Silver maple, noted for weak crotches, weak wood, and susceptibility to wind damage and ice storms (9,22), was damaged only moderately. This might have been due to their tendency to break at the upper or mid branch position when loaded with ice rather than at major branch junctures. In addition, silver maples in Urbana had been pruned regularly since 1976, possibly contributing to the low incidence of major damage. Pruning to remove structurally weak branches is probably an effective strategy to minimize ice storm damage.

Tuliptree suffered moderate to severe damage from the Urbana ice storm. Severe damage to tuliptree has occurred in other ice storms (7,20,27). Some reports indicate low susceptibility (2) and moderate susceptibility of tuliptree to ice storm damage (18). Plant age, site, and structural integrity probably account for the differing reports (28).

Norway maple and sugar maple sustained little severe damage. Norway maple seems to resist ice storm damage (9,10). Although we observed little damage to sugar maple, other reports indicate this species is intermediate in susceptibility (9,18,22).

Sycamore trees sustained severe ice storm damage in Urbana. Reports indicate that ice damage can range from little to severe for sycamore (2,12,14).

Anthracnose (*Apiognomonia veneta*) infects sycamore annually in Urbana. This disease sometimes causes death of twigs and loss of terminal bud dominance (116). Lateral buds then assume temporary dominance causing a proliferation of shoots along branches. It is possible that the increased surface area which occurs as a result of anthracnose may increase the susceptibility of sycamore.

The small size of Kentucky coffeetree, silver linden, and littleleaf linden in Urbana probably accounted for their avoidance of ice damage. Nonetheless, 15% of the littleleaf lindens (66 trees) were between 13 and 24 inches dbh and none were damaged. Kentucky coffeetree has previously been reported to be resistant to an ice storm (14).

Most trees that are small at maturity sustained minor damage. Examples include ironwood, serviceberry, Eastern redbud, and amur maple. Ironwood has previously been reported resistant to ice storms (3,22).

Bradford pear were severely damaged by ice accumulation. Bradford pears often have narrow crotches with included bark. Included bark is responsible for weak branch attachment. In contrast, the Aristocrat pear has branches that are more horizontal with a wider crotch angle (11) and exhibited greater ice storm resistance than Bradford pear. Of the 21 Aristocrat pear between 3 and 9 inches dbh, none was damaged.

Pin oak suffered greater damage than northern red oak, white oak, and swamp white oak. The majority of pin oak were greater than 12 inches in dbh and this species has a finer pattern of branching than other local oak species. The majority of northern red oak, white oak, and swamp white oak in Urbana were less than 13 inches in dbh. The lack of damage to these species on Urbana parkways may be attributable to their smaller diameter and coarser branching patterns.

Damage in local native hardwood forests occurred at forest edges where longer and lower branches exist. The narrow, high crowns of forest trees were less susceptible to damage than the crowns of open-grown urban trees. Among the common native upland oak species, only a few northern red oaks, which have a shallower rooting pattern than other native upland oak species, were uprooted by the gravitational pull of accumulated ice. Other authors report northern red oak intermediate in susceptibility to ice damage (1,3,18,22).

Cannell and Morgan (5) studied branch breakage under snow and ice loads and found that branching patterns affect the capability of a branch to resist ice damage. Shoots with laterals are more likely to fail under an ice load than shoots of the same midpoint diameter or length without laterals. Observations from this ice storm are consistent with the idea that branch breakage increases with the degree of lateral branching and density of small branches (4,15,22). For example, heavily-damaged Siberian elm and common hackberry exhibit a high density of small branches.

In addition to crown architecture, pre-storm conditions such as an imbalanced

crown, included bark, or dead wood may have predisposed a tree to ice damage. The majority of damaged Siberian elm, common hackberry, and honeylocust inventoried in 1988 had been reported to have structural imperfections, disease symptoms, or insect damage. Butler and Swanson (4) suggested that structurally weak crotches were the principal cause for honeylocust damage in an ice storm.

No apparent relationships exist between ice storm damage susceptibility and specific gravity, modulus of rupture, or modulus of elasticity of a tree species (Table 3). Hence, the strength of wood seems less important in ice-accumulation tolerance than the capacity to accumulate ice until it surpasses the bearing capacity of branches.

Table 3. Common wood physical and mechanical properties related to strength for tree species in Urbana, ranked in descending order of ice storm damage severity.

Tree Species	Specific¹ gravity (g/cm³)	Modulus¹ of rupture (psi)	Modulus¹ of elasticity (psi 10⁶)	Percent damaged
Siberian elm				41.7
Honeylocust	.60	10,200	1.29	12.7
Bradford pear				8.8
Hackberry	.49	6,500	0.95	8.8
Pin oak	.58	8,300	1.32	8.4
Sycamore	.46	6,500	1.06	0.7
Green ash	.53	9,500	1.40	6.9
Tuliptree	.40	6,000	1.22	6.6
White ash	.55	9,600	1.44	5.9
Silver maple	.44	5,800	0.94	3.9
Bur oak	.58	7,200	0.88	3.1
Baldcypress	.42	6,600	1.18	2.2
Norway maple				1.9
Sugar maple	.56	9,400	1.55	1.9

Black walnut	.51	9,500	1.42	1.8
Red maple	.49	7,700	1.39	1.3
Am. sweetgum	.46	7,100	1.20	1.2
L'leaf linden				0.9
White oak	.60	8,300	1.25	0.7
N. red oak	.56	8,300	1.35	0.6
Ginkgo				0.0
Swamp wt. oak	.64	9,900	1.59	0.0
Arborvitae	.29	4,200	0.64	0.0
Silver linden				0.0
Kentucky coffeetree				0.0

¹USDA (1974)

Cannel and Morgan (6) believe that measures of branch and trunk strength derived from standardized tests such as modulus of elasticity should include intact bark, as branches and trunks naturally contain bark. The bending of tree branches from ice or snow accumulation more closely fits the structural theory for cantilever beams where one end is fixed and the other is free, rather than modulus of elasticity tests in which a sample is supported on both ends (19). Redden (21) states that a tree is bound together primarily by cantilever joints with inherent characteristics that allow bending and twisting in response to loading by wind, snow, and ice.

An ice storm tolerance rating of commonly planted urban trees was developed from the results of this and other ice storm studies (Table 4). Rankings follow the majority findings of published reports and are not totally consistent with our findings from the Urbana ice storm.

Table 4. Ice storm susceptibility of tree species commonly planted in urban areas.

Susceptible	Intermediate	Resistant
Siberian elm ^{lm}	White ash ^{cehijm}	Eastern hemlock ^{dehk}

American elm ^{bcefhgj}	Red maple ^{cdegijklm}	Arborvitae ^{acefgm}
Honeylocust ^m	Northern red oak ^{cdhjkm}	Baldcypress ^{am}
Common hackberry ^{bcjm}	Tuliptree ^{eghiklm}	Norway maple ^{fgm}
Bradford pear ^m	Sycamore ^{bekm}	Catalpa ^{cfl}
American linden ^{cehj}	Eastern white pine ^{dehm}	Ginkgo ^{am}
Black cherry ^{ehjk}	Bur oak ^{cm}	American sweetgum ^m
Black locust ^{cde}	Sugar maple ^{cfghjm}	White oak ^{bcdikm}
Silver maple ^{abcfghm}		Swamp white oak ^{cm}
Pin oak ^m		Littleleaf linden ^m
Green ash ^m		Silver linden ^m
		Kentucky coffeetree ^{bm}
		Black walnut ^{fm}
		Ironwood ^{cjm}
		Blue beech ^{ck}

Sources:

a von Schrenk (1900), **b** Harshberger (1904), **c** Rogers (1923), **d** Abell (1934), **e** Downs (1938), **f** Croxton (1939), **g** Deuber (1940), **h** Lemon (1961), **i** Whitney (1984), **j** Bruederle (1985), **k** Boerner (1988), **l** Pirone (1988), **m** This study (1993)

Summary

Trees with an excurrent branching habit (conical form) such as conifers and young American sweetgum, and species with less branch surface area, such as black walnut, American sweetgum, ginkgo, Kentucky coffeetree, white oak, and northern red oak showed the least damage due to ice accumulation. There was no

clear relationship between specific gravity of wood, modulus of elasticity, or modulus of rupture and tolerance of trees to ice accumulation. Oak trees and honeylocust both possess strong, dense wood. Overall, oaks (except pin oak) generally avoided damage, while honeylocust trees did not. Horizontal branching in some trees seemed to be as good or better in resisting breakage due to ice accumulation than branches approaching near vertical position, such as Bradford pear.

These observations provide information useful in selecting trees with tolerance to ice accumulation. Further study will be necessary to precisely predict the degree to which characteristics of a given tree species interact to afford tolerance of ice accumulation.

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Appendix 1. Scientific nomenclature for common names used in this study.

Common name	Scientific name
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Amur maple	<i>Acer ginnala</i>
Norway maple	<i>Acer platanoides</i>
Red maple	<i>Acer rubrum</i>
Silver maple	<i>Acer saccharinum</i>
Sugar maple	<i>Acer saccharum</i>
Serviceberry	<i>Amelanchier</i> spp.
Blue beech	<i>Carpinus caroliniana</i>
Catalpa	<i>Catalpa</i> spp.
Common hackberry	<i>Celtis occidentalis</i>
Eastern redbud	<i>Cercis canadensis</i>
White ash	<i>Fraxinus americana</i>
Green ash	<i>Fraxinus pennsylvanica</i>
Ginkgo	<i>Ginkgo biloba</i>
Honeylocust	<i>Gleditsia triacanthos</i> var. <i>inermis</i>
Kentucky coffeetree	<i>Gymnocladus dioicus</i>
Black walnut	<i>Juglans nigra</i>
American sweetgum	<i>Liquidambar styraciflua</i>
Tuliptree	<i>Liriodendron tulipifera</i>
Ironwood	<i>Ostrya virginiana</i>
Jack pine	<i>Pinus banksiana</i>
Table-mountain pine	<i>Pinus pungens</i>
Pitch pine	<i>Pinus rigida</i>
Eastern white pine	<i>Pinus strobus</i>
Virginia pine	<i>Pinus virginiana</i>
Sycamore	<i>Platanus occidentalis</i>
Black cherry	<i>Prunus serotina</i>
Aristocrat pear	<i>Pyrus calleryana</i> 'Aristocrat'
Bradford pear	<i>Pyrus calleryana</i> 'Bradford'
White oak	<i>Quercus alba</i>
Swamp white oak	<i>Quercus bicolor</i>
Bur oak	<i>Quercus macrocarpa</i>

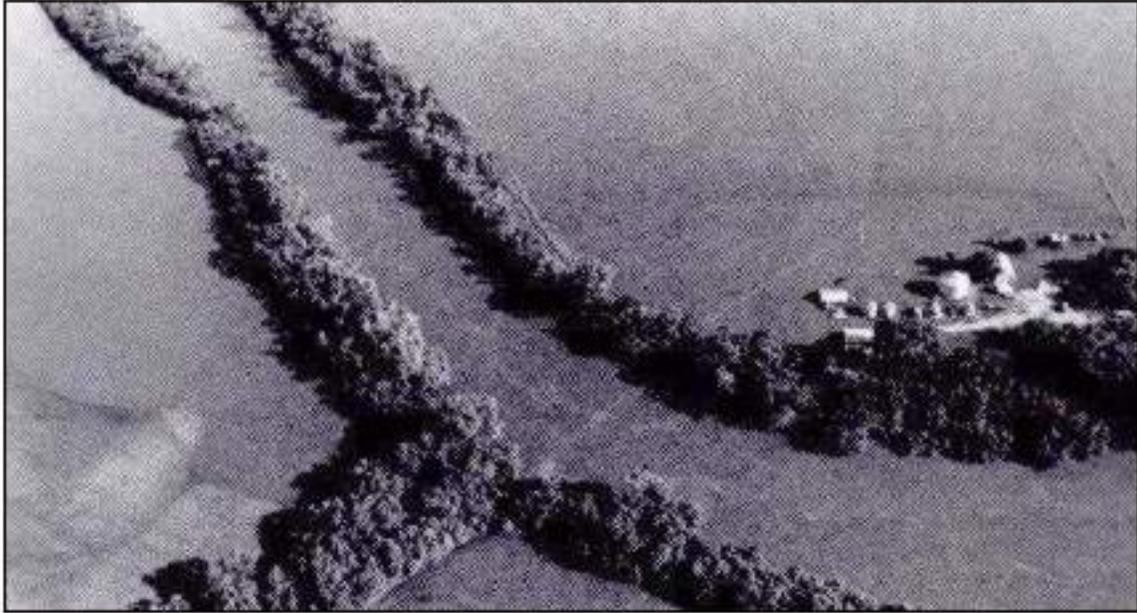
Pin oak	<i>Quercus palustris</i>
Northern red oak	<i>Quercus rubra</i>
Black locust	<i>Robinia pseudoacacia</i>
Baldcypress	<i>Taxodium distichum</i>
Arborvitae	<i>Thuja occidentalis</i>
American linden	<i>Tilia americana</i>
Littleleaf linden	<i>Tilia cordata</i>
Silver linden	<i>Tilia tomentosa</i>
Eastern hemlock	<i>Tsuga canadensis</i>
American elm	<i>Ulmus americana</i>
Siberian elm	<i>Ulmus pumila</i>

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Chapter 4

Appendix C



F L O O D I N G

and its effect on TREES

Information Packet

This publication was developed by specialists in Forest Resources Management and Forest Health Protection, USDA Forest Service, Northeastern Area State and Private Forestry, St. Paul, MN.

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September 1993

*Photo above courtesy of Mankato Free Press.
The river's usual channel is marked by the row of the trees.*

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Chapter 4

Appendix D





HELPING TREES WEATHER NATURE

***Mother Nature can be brutal to urban trees.
Here are some tips on how you can help soften the
blow.***



The aftermath of Hurricane Andrew in Florida speaks for itself.

By Anne Semrau

Anne Semrau works with
AMERICAN FORESTS'
Cool Communities
program.

After the warmth of a mild autumn, an abrupt and extreme switch to below-zero winter temperatures was one of the last things the people of Colorado and neighboring states expected. But on October 27, 1991, that's exactly what happened. Now known as the Halloween Freeze, it began when an Arctic cold front from Canada descended onto the high plains of the United States. Within hours, the temperature had dropped by as much as 50 degrees Fahrenheit.

For many of the trees, the unexpected cold was a final and fatal blow. Weakened by an extended drought and not yet physiologically prepared for winter, trees died by the thousands. Some small towns lost 70 percent of their urban forest, which often consisted largely of a single species- the popular and fast-growing Siberian elm (*Ulmus Pumila*).

Not all catastrophes are completely unexpected: The people of Dade County, Florida, knew that Hurricane Andrew was headed their way. But even though the

hurricane was not a surprise, the extent of its damage was. Sixty to 90 percent of the region's urban forest was decimated, and almost all the nursery stock in southern Florida was destroyed.

Catastrophic weather events like Hurricane Andrew or the Halloween Freeze are played out regularly across the United States. Floods, freezes, storms, and fires periodically sweep through areas, exacerbating droughts or other conditions, and finding the tragic flaws in our urban forests.

Forest management- urban or rural- requires an understanding of how these weather conditions affect trees. Even though it's probably impossible to save a forest in the path of a hurricane, tornado, flood, or fire, by understanding the forces that shape the natural landscape and how urban forest stewardship can influence these forces, we can reduce the hazard and the damage.

Freeze

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Like all wildlife in autumn, trees prepare for the coming winter. In early autumn, soon after twigs stop growing, trees initiate a series of physiological changes that alter the chemical nature of their cells. They "harden" themselves to winter by reducing the concentration of water in their cells and by increasing the concentration of natural "antifreezes," like sugar and glycerol.

Trees thus prevent damage that may occur in two ways: 1) Freezing water expands, creating relatively large, hard ice crystals that can puncture the delicate cell membranes and destroy the cells; and 2) Water freezing in the spaces between cells can pull water out of nearby cells, drying them out so much that they collapse.

According to Ron Gosnell, area forester for the Colorado State Forest Service, "It takes time for plants to produce natural antifreezes. When they do, it depends on seasonal and genetic components."

With regard to the devastation wrought by the Halloween Freeze, Gosnell reports that "the trees weren't prepared." In particular, the Siberian elm, "which continues to grow in a wider envelope of conditions, still had leaves while most other trees had dropped theirs."

Freezes are common throughout most of the United States, with only southern California and Florida largely exempt. But even if you and your trees live in a "freeze-zone," there's still a few things you can do to help your trees.

First, avoid potential damage by planting the right trees in the right spots.

"If an exotic tree is stressed by weather all the time, then that tree is weakened," says Jack Petit, executive director of Streetscapes in Mobile, Alabama. "But just because a tree is from the area, doesn't mean it's resistant to the weather. The wise thing to do- weeks or months later, after cleanup- is drive through the area and see what did well and what didn't."

Ron Gosnell concurs: "Take a look at the location. Choose the right tree for the right place. Look for the best kinds of species that grow well, and plant them."

And trees already planted- right or wrong- can be helped somewhat: "There are some precautions you can take. Stop watering trees in late August. If you stop watering, it stimulates them to go into dormancy. If you continue to water, they'll keep growing and they'll get caught," says Gosnell. "But after dormancy, water a lot."

In general, anything that might encourage or renew fall growth- such as late-season irrigation, fertilization, or pruning- should be avoided. If more intensive procedures are justified, potential freezing could be reduced by direct air heating or by slow-moving fans that prevent cold air from pooling. But because heating and fanning techniques are both elaborate and expensive, they are used mainly for fruit-tree groves and rarely in the urban forest.

Fire

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About 80 years ago, town planners in Oakland, California, looked up at the sparsely wooded hills of the town and envisioned a forest. Three species were selected to do the job: Monterey pine (*Pinus radiata*), Monterey cypress (*Macrocarpa Cupressus*), and bluegum eucalyptus (*Eucalyptus globulus*). None are native to Oakland, but perhaps more important is that they all produce and shed large amounts of flammable debris.

In 1991, a fire- presumably of human origin- was started, thought to be extinguished, and then rekindled. The sparks set off a grove of dry, drought-stressed Monterey pines. Within 15 minutes, the fire engulfed 50 to 60 homes, and continued to bum until the weather changed. The final result: a tremendous amount of landscape damage.

Tony Acosta, Oakland city forester, reports that there was "almost complete mortality among the pines and cypresses, especially those near houses that burned very hot." The mortality rate was lower for the eucalypti: "The eucalyptus trees spread a fire quickly, but they can survive it. The trunks or woody stems of the trees are wet and fireproof." Native species such as coast redwood and coast live oak "came through damaged but surviving. These species are adapted to fire." Unfortunately, fire-damaged trees are at risk for other hazards-weakened trees are susceptible to injury by insects, disease, and drought.

Acosta believes that the Oakland fire is "the fire of the future," a hazard that could recur. "We could have some real big fires; we could have another one here. It has to do with people developing homes in forests. When the home density is high and the risk is high, the loss will be high. We have to either reduce risk or reduce density."

Risk can be reduced by "firescaping"- designing and maintaining a fireproof landscape. In a 30-foot zone around the house, landscape with fire-retardant plants, such as those with thick succulent or leathery leaves. Avoid "pyrophytes," extremely flammable plants high in oils or resins. Maintain open spaces between planting areas and buildings, remove low or dead tree limbs and all dry litter, and irrigate this area regularly. (See "Preventing Urban Wildfires," **Urban Forests** October/November 1992, and "Paradise Burning: How To Live with Wildfire," **American Forests** January/February 1992.)

Drought

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Drought damage is usually first noticeable as wilting-leaves that visibly droop-or early fall color and leaf loss. If not relieved, the effects of drought can progress to leaf "scorching," brown leaf margins, to "drought cracks" that radiate from the bark to the center of the tree, and to "dieback," the progressive killing of the tree from the outer edges and limbs inward. By subjecting plants to a complex mix of dehydration and overheating, droughts reduce a plant's ability to transform and accumulate energy, affecting most plant processes, especially plant growth.

Ultimately, this stress, especially if combined with other problem weather conditions or attacks by pests or pathogens, can kill the tree.

"There's essentially a threshold- when it occurs, entire stands die," says Acosta. "And at that point, they create a fire hazard."

Even native, drought-tolerant trees are not immune: Acosta says that the oaks that gave Oakland it's name, "are reaching the end of their rope in ability to cope."

Droughts, long periods of below-normal rainfall, are more common in the western United States, but any area can show the effects of dehydration. Urban areas, in particular, are dry, making the urban forest especially prone to drought damage.

"We're encouraging irrigation systems- rainfall or greywater collection systems," says Acosta. Greywater is "used" water- water collected from the sink, tub, shower, or washing machine that can be carried out to the trees. Some municipalities have restrictions on the use of greywater; first check with your city or county health department. Rainwater either can be collected in barrels or tanks and used later, or diverted to trees through "leaching lines." Leaching lines are long ditches- about six inches wide and one foot deep, mostly filled with gravel and covered with soil- that allow water from rainspouts to flow to trees.

In times of drought or water rationing, these systems can provide a much-needed drink for trees. But regardless of irrigation method, water trees slowly, deeply and often-a large, leaky bucket placed near a tree's trunk and refilled several times will. do the trick. Here are some other tactics to help drought-stricken urban

forests: avoid extensive pruning, especially with sensitive species; plant drought-resistant species in early spring or fall; avoid planting in shallow soils; and maintain a layer of mulch around the base of trees.

Flood

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Provided the flood's just a brief episode with standing water, not a fast-moving, uprooting assault, "city trees probably enjoy a flood," laughs Jack Petit, "since medians and other urban situations dry out very fast."

But most floods- often caused by torrential rainstorms over water-saturated soils or, in urban areas, by inadequate or blocked drainage channels-are just way too much of a good thing. And although they're more common in the relatively flat and wet Southeast, floods are a weather fact-of-life across the country.

One way that floods damage trees is by softening or removing soil that supports the tree's roots. "Trees standing in wet soil are like you standing on a bog, trying to keep your balance with the ground moving under you," says Gary Moll, AMERICAN FORESTS' vice president for urban forestry. "Trees can lose their ability to hang on."

As for trees that manage to hang on, only to succumb later, two theories exist on how damage occurs: one, that organic toxins accumulate in the soil, and two, that aeration is reduced by the standing water. Whatever the cause, the typical early-warning sign of flood damage in standing trees is chlorosis- pale-colored leaves that have lost chlorophyll. Chlorosis generally is followed by leaf browning and ultimately, leaf loss.

Although "swamp trees," such as red maple and sycamore, are accustomed to wet, poorly aerated soils and may be less damaged than other species, prolonged

submergence can damage any tree. Tree survival in flood-prone areas can be improved by careful species selection and, if possible, by providing ways for water to drain off quickly rather than evaporate slowly.

Wind

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Flooding can waterlog a tree's root system and cause rotting.



"**M**ost of the trees were demolished. The hurricane took roofs off, snapped trees completely in half. A few tornadoes hit tree farms- the pine trees looked like 50-foot-tall beavers had come by." That's how Jennifer Rooks of Massachusetts ReLeaf describes the aftermath of Hurricane Bob's 1991 landing on the south shore of Cape Cod.

Whether the result of a hurricane, tornado, or storm, high winds cause predictable kinds of damage to trees. Leaves and branches are stripped off, trees are uprooted, twisted, and broken; and if winds are greater than 200 mph, the trees can be completely debarked by small, flying debris. Some trees are more susceptible to wind damage than others. In general, the taller the tree, the more brittle the wood; the smaller the rootball, or the tighter the tree holds onto its leaves, the more susceptible the tree is to windthrow- being blown over- and windbreak- being broken by wind.

Since hurricanes, tornadoes, and thunderstorms are seasonal, Jack Petit recommends, "Every year, at the beginning of the bad season, check your trees. Go outside and look up at the trees. Look for dieback, cracked or dead branches, hanging branches that could hit the house or power lines. Have pruning done by a licensed professional with a good reputation."

"A tree that is well-pruned, with a good root system and plenty of room to grow, will withstand strong winds better than one with dead, weakened branches," adds Ron Gosnell.

In addition to regular pruning and maintenance, encourage a mixture of tree sizes and age classes. Make sure trees have enough room to develop adequate roots. And don't plant trees with brittle wood where breakage could create additional damage.

Tornadoes are reported annually in almost every state, and are especially common during winter months in states bordering the Gulf of Mexico. In the spring and again in the fall, they become more frequent in the central plains and Ohio Valley and during the summer, they're more common in the northern plains, upper Midwest, and Great Lakes region.

Hurricanes are common along the Gulf and Atlantic coasts in summer and early autumn. Except along the Pacific Coast, thunderstorms are most frequent during warm months and mainly occur in two areas in the United States: from the crest of the Rocky Mountains in Colorado and New Mexico east to the High Plains, and along the east Gulf Coast and Florida.

Lightning

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Hurricanes and tornadoes are usually accompanied by thunderstorms and lightning, weather conditions that can cause their own damage to trees.

Because of their height, trees are a favorite target of lightning. Lightning-strike damage varies- there may be no damage, if the electricity is conducted along the

outside of the tree, there may be scarring where bark is torn off the tree, or there may be trunk shatter, in which the lightning charge penetrates into the tree's stem, turning moisture into steam and causing the tree to explode.

Oaks, elms, poplars, and pines are most commonly struck, but are also the trees most commonly found in isolated positions. Beech trees seem less susceptible than would be expected; when wet, the smooth bark may conduct electricity outside the tree. High-value trees can be protected by installing a multi-pointed lightning rod (one that extends from several major branches) connected solidly to the ground with a heavy copper or aluminum cable. Otherwise, fives can simply be pruned for safety, and given regular care to promote health.

HEALING THE URBAN FOREST

"Two months after Hurricane Hugo, we started to plant trees in our community with the help of Global ReLeaf," says Lydia Evans, executive director of Lowcountry ReLeaf. "The new trees gave us a sign of hope that we could get our fives back on track."

Today, AMERICAN FORESTS' Global ReLeaf program, along with the USDA Forest Service and state forestry agencies, is helping additional disaster-struck communities repair and replant their urban forests. Communities affected by Hurricanes Andrew or Iniki, as well as the Halloween Freeze, will be provided with expertise to help heal their urban forests. Individuals, businesses, and organizations who wish to support these reforestation efforts can send a tax-deductible donation to AMERICAN FORESTS, P.O. Box 2000, Washington, DC 20013-2000.

"A tree that is well-pruned, with a good root system and plenty of room to grow, will withstand strong winds better than one with dead, weakened branches."

-Ron Gosnell

Ice Storm

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"The favorite haunt of the ice storm is an L-shaped belt extending from central Texas northward to Kansas, then eastward across the Ohio Valley and the lower lakes to New England and the Middle Atlantic states. Throughout this belt there is at least a one-in-three chance of a serious storm occurring every winter," writes George H.T. Kimble in *Our American Weather*.

Most other states aren't immune- only six of the mainland 48 states- Florida, New Mexico, Arizona, Utah, Nevada, and southern California- are habitually free from the extreme havoc caused by freezing rain. Given these odds, it makes sense for a large part of the country to prepare for winter ice storms.

Caused by rain that supercools or freezes as it passes through below-freezing air, ice storms coat their immediate vicinity with varying thicknesses of glaze. These ice coatings can grow to be several inches thick, with weights measured in tons. Typically, the weight of the ice, combined with any wind or outside forces, breaks the trees' stems and branches.

According to Peter Innes, a New York state forester, the damage is 'comparable to severe hurricane damage.' An ice storm that hit 13 counties in the Rochester area

on March 3,1991, "basically damaged all the trees, with greater than 50 to 60 percent loss of limbs." This damage was particularly severe due to its timing-a thaw had preceded the storm, and the ground was soft. "Some trees lost their anchors and simply tipped over," says Innes.

Normally, the taller and older a tree, the more susceptible it is to ice damage. Older trees have larger crowns, more internal decay, and less limb and trunk flexibility. There are, however, considerable differences among species when it comes to resistance to ice injury. Some species with high ice-storm survival rates include: yellow birch (*Betula alleghaniensis*), American hornbeam (*Carpinus caroliniana*), shagbark hickory (*Carya ovata*), hawthorn, northern catalpa (*Catalpa speciosa*), common horsechestnut (*Aesculus*), beech, white ash (*Fraxinus americana*), ginkgo, Kentucky coffeetree (*Gymnocladus dioicus*), butternut (*Juglans cinerea*), American hophornbeam (*Ostrya virginiana*), spruce, oak (except the pin variety) and eastern arborvitae (*Thuja occidentalis*). Where early-winter ice storms are common, avoid planting trees that hold their leaves late into fall. And, as always, maintain the health of your trees through regular pruning, fertilizing, and watering.

Although we can- and often do- talk about the weather, we can't do much about it. But we can do something about how trees are affected.

Appropriate urban forestry- putting the right trees in the right places.-is a start. Understand the forces that shape the natural landscape. Learn from the effects of natural selection on your urban forest. Select trees that are adapted to local weather conditions while maintaining a diversity of species, sizes, and ages. Plant trees that can survive and plant them right- Give them the space, both above ground and below ground, that they need to grow.

As Jennifer Rooks says, when planting trees, "consider more than where it will look nice."

And after planting the right trees in the right places, care for them-water them regularly, fertilize as needed, and prune away dead or dying branches.

Whatever the weather, one thing should come through loud and dear "Prevention is the key," Jack Petit says. "If we were able, if the city was able, to take care of these trees, we wouldn't have these problems." **UF**

HOW TO RECOVER FROM A DISASTER

Storm damage to trees- whether caused by flood, freeze, wind, or other disasters- has some common components:

Trees may be uprooted, and



Lightning and wind can conspire to cause great damage to trees.

stems, branches, and roots may be broken or scarred.

But even though trees may be battered, and some killed, most trees that are still standing can survive. The trick is to help them recover from the damage and the stress, without creating additional problems for yourself. Here's some tips to help you do just that:

Remove Immediate Hazards First

To help keep you and your tree alive, the first step is to remove any immediate hazards. These include:

- Dead trees.
- Trees or branches that are leaning on trees, powerlines or other structures.
- Trees with broken or cracked stems.
- Trees that have lost 50 percent or more of their branches.
- Trees with broken roots.

- Any large, dead or broken limbs that are still attached to the tree.

Since removing tree hazards can be dangerous, don't attempt to learn on the job. "Big pruning is not something a homeowner should do, especially if they've never done it before," says Gary Moll, AMERICAN FORESTS' vice president for urban forestry. "You can do a lot of damage to the tree and seriously hurt yourself in the process.

Bill Kruidenier, president of the International Society of Arboriculture (ISA), agrees. Trimming large trees is for the pros, he says. 'If the branch needing pruning can be trimmed from a stepladder, it's a homeowner-sized job. If you have to climb a tree, that's the time to call a professional."

Consult a professional arborist when confronted with the following situations:

- The work requires climbing or chainsaws.
- Any major repair- cabling, large branch removal.
- The tree or branch is leaning on another tree or structure. Contact your local telephone or electric company if any trees or branches are leaning on wires. These wires may be "hot," so let the utility take care of them.

Re-rooting Small Trees

Small, young trees that were uprooted by the storm can sometimes be rescued and re-rooted, especially if their roots were kept moist and much of their canopy was retained.

To re-root: First, prune any broken roots to prevent disease. Next, remove soil on the uprooted side so the roots can fit back into the hole. Carefully straighten the tree, without breaking any roots. Once the tree is upright, replace the soil and stake the tree to prevent movement for several months. Water the area thoroughly to remove air spaces around the roots,

Hiring an Arborist

"There were a tremendous number of vultures in human suits that

descended on the victims of [Hugo], and tree-cutters were no exception," says Jay Clingman, South Carolina's coastal region urban forester. "The Forestry Commission and other governmental agencies published 'fair prices' through the media for various tree-care practices. This was highly unusual, but we were faced with contractors charging unknowing victim \$20,000 to remove two trees from their house."

Bob Felix, executive vice president of the National Arborist Association (NAA), concurs. "After a storm, everybody with a chainsaw becomes a tree expert. If a storm damages your trees, your long-term interests are best served by using trained, insured, and experienced professionals to remedy the problems."

Felix offers the following tips for contracting tree-care service after a storm:

- Be certain that the firm you hire is qualified and dependable. If you can, shop around. Contact local forestry groups, reputable local services, or government agencies to find reasonable prices. Only accept firm prices for work or, if the work must be done on a hourly basis, get competitive bids. Always establish a limit on hourly work beyond which the contractor cannot proceed without your approval.
- Select a firm that has a professional affiliation such as membership in the National Arborist Association (NAA) or the International Society of Arboriculture (ISA). Such affiliations are an indication that the firm uses the most current technology and has a commitment to professionalism. Call NAA or ISA for member firms in your area.
- Require the contractor to provide references and certificates of insurance (both worker's compensation and general liability). Require that all tree-related work be performed according to NAA Standards of Practice. These standards are available at no charge and can be obtained by written request (include a self-addressed stamped envelope).

Preventing Additional Damage

A few months later, after the immediate hazards have been removed and life has settled down, take some time to do some

preventative pruning. Prune back any broken branches at the branch collar. Do not "top" trees or prune branches so that branch stubs extend beyond the branch collar. This will only weaken the tree in the future. By removing jagged branch stubs, the tree can cover its wounds with less risk of hazardous decay. Also, check your tree's form- if it has a lop-sided look, prune to balance the tree's canopy.

Some hazards might not show up at first- check for the following hazards every six months for several years. Contact a professional if the tree seems to need corrective work.

- **Root damage.** During a storm, the wind rocks trees and can damage the roots. The extent of root damage, which can kill a tree, is often not apparent for two or three years. The damage first becomes apparent as dieback, usually beginning from the top of the tree.
- **Decay.** Does the tree show signs of internal *rotting-fungus* on roots, in hollows, or on any dead spots? If so, determine if this is a major structural problem and hazard.
- **Insect attacks.** Stressed, dying, and dead trees attract insect pests. Remove insect-infested trees if these insects can damage nearby healthy trees.

-ANNE SEMRAU

† *This feature is sponsored by the USDA Forest Service.*

For more information about appropriate trees for your area, call or write your city or state forestry department, local tree group, or county USDA Extension Service. Listings for these groups, as well as additional information on tree planting and care, can be found in AMERICAN FORESTS' tree-planting handbook Growing Greener Cities.

Additional resources include:

- *National Arborist Association (NAA), National Headquarters, P.O. Box 1094, Amherst, NH 03031-1094; 603/673-3311. Contact your local chapter or the national headquarters for a list of members in your area.*
- *International Society of Arboriculture (ISA), P.O. Box 908, Urbana, IL 61801; 217/328-2032. Call for a catalog of available materials and a list of members in your region.*

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Chapter 5

Regreening the Community

5.1 Chapter Summary

Major and minor storms are differentiated by the amount of damage, the amount of assistance needed for clean up, or the number of trees lost or injured. Clean up time will be much longer for a major storm and the regreening process will take years.

Once storm damage debris have been removed, an array of reforestation opportunities are available. A variety of occasions are available to replant or repair the urban forest that has been damaged by a natural disaster. Urban trees and forests, municipally managed or privately owned, can be regenerated through carefully orchestrated programs. Key players involve elected officials, volunteer community leaders, and municipal employees.

A variety of technical and educational resources are available to assist in the "regreening" of a community after a disaster. Involvement and commitment of both elected officials and volunteer community leaders is critical to the success of these efforts. Sources of technical assistance range from local urban forestry professionals and state natural resource agencies, to the USDA Forest Service, or other national professional or volunteer organizations.

Recognition awards for communities, such as Tree City USA or the Tree City USA Growth Award, provide opportunities for communities to promote their successes. Many states offer state level recognition awards as well.

Public support for community tree care programs can be achieved through awareness programs that promote the benefits of trees. Often, the education of caring, active citizens will generate the necessary support needed to start a program or keep a program alive. The goal for a community should be to have an effective, comprehensive urban and community forestry program.

5.2 Chapter Outline

- I. Major/Minor Storms--Difference and Similarities
 - A. Key Differences and Similarities
 - B. Sources of Assistance
- II. Long-term Effects of Natural Disasters--The Clean up Process
- III. Long-term Effects of Natural Disasters--The Regreening Process
 - A. Benefits of Trees
- IV. A. Comprehensive Urban and Community Forestry Program
 - B. 12 Indicators of an Effective Tree Care Program
 - C. Community Tree Care Through Combined Efforts
 - D. Urban and Community Forestry Regreening Awards and Recognition
 1. Tree City USA Standards
 2. Tree City USA Growth Award
- V. For More Information / References
 - A. Appendix--[How to Fund Community Forestry](#)
 - B. Appendix--[Tree City USA: Foundation for Better Tree Management](#)
 - C. Appendix--[Tree City USA Growth Award Application](#)

5.3 Major and Minor Storms--Differences and Similarities

Major storms and minor storms have a number of significant differences and similarities that impact how a community will plan, respond and regreen. Many of the differences relate to the amount of damage, the impact of the damage not only on the tree resource but on the community itself, and the length of time for recovery. Obviously, major storms will have more severe damage that will require a larger response and clean up effort.

A. Key items to note regarding differences and similarities of major and minor storms.

- Major storms may force a community to seek assistance from outside their community (arboricultural firms, neighboring communities, counties, and states) for clean up crews.
- Minor storms, if planned for appropriately, may be handled by local staff and crews.
- Major storms tend to cause more damage and produce large amounts of debris that will require clean up, disposal and/or possible utilization. Communities should identify clean up plans, additional resources to aid

clean up, a plan to separate tree debris from other debris for potential utilization, disposal options, debris storage and handling sites, and ways to handle debris on private land.

- Major storms may injure or destroy a large portion of the communities tree population. Communities must recognize that regreening efforts will not and can not be immediate. Rather, they should plan regreening efforts for many years. If a community were to lose all trees in a certain area and replant every site within 2 years, the community may put itself into jeopardy of having an even-aged stand of trees.

B. Sources for Assistance

Guidance for regreening efforts can be provided by a number of resources, agencies and organizations. State Forestry or natural resources agencies can provide technical assistance and information on available grants and possible contacts for related experiences and information. State agency staff may be available to provide direct technical assistance.

If the area is declared a State or Federal Disaster, State and Federal Emergency Management agencies can provide relief efforts and resources. (Refer to Chapters 6 and 8 for detailed assistance information.)

The USDA Forest Service can provide technical assistance in the form of publications (such as "Storms Over the Urban Forest") and information sharing and guidance on available grants and funding. Additional sources of assistance include county and state Extension Offices, colleges and universities, and private consulting foresters, landscape architects, and tree expert firms. Professional organizations such as the National Arborists Association, the International Society of Arboriculture, and the Society of American Foresters are also ready to assist. Volunteer organizations such as American Forests, the Carden Clubs of America, the National Arbor Day Foundation, individual state beautification councils and environmental groups, also stand ready to help. Nearby communities that may have experienced a similar natural disaster may be an excellent source for relevant advice, assistance and information. Refer to Chapter 9, "Technical Resources and Information" for address and contact information for sources of assistance.

Regreening must be predicated on the commitment of both municipal leaders and private citizens to maintain the new urban forest once it has been established. Pledges and funds to plant trees are fairly easy to obtain. High-spirited tree planting ceremonies, especially when linked to Arbor Day celebrations, usually are well publicized and well attended. Nevertheless, when municipal budget hearings determine maintenance support of the new trees, competition among vital

community services becomes a compelling reality. At the private property level, when a homeowner's trees are in need of maintenance, costs may not have been anticipated or planned for. **Thus, both tree planting and maintenance costs at the public *and* private levels must be incorporated within the regreening concept.**

5.4 Long-term Effects of Natural Disasters--The Clean up Process

Not only do natural disasters impact trees, they impact homes, businesses, vehicles, utility services, and a myriad of other things people tend to take for granted every day. Recognizing this, one must recognize that after a natural disaster has hit, trees are simply another element to deal with in the clean up process. Preplanning and education prior to any disaster may aid the clean up process, and may save many trees. The following are some factors to consider and plan for as part of the clean up process. Refer also to Chapter 8, "Notes from Hurricane Andrew," Section 8.5, for additional information on clean up activities.

- Recognize that a tremendous amount of debris is generated as a result of a natural disaster. (See *Photograph 6*.) People will tend to include wood waste as a part of the building materials and other debris. Preplanning and public education that debris from trees should be separated for chipping and utilization is key.

Volunteers can be used to separate out tree materials, and chipper trucks and crews can be utilized to chip this material. In many cases, the chips can be left at the residence or a nearby storage site for landscaping and gardening. Not only does the community save on landfill costs, the residents gain from this material.

(*Note:* Most states have adopted or are adopting landfill regulations that restrict wood waste. Communities should identify alternate uses for this material.)



Photo 6. View of extent of damage caused by Hurricane Andrew.

(National Oceanic and Atmospheric Administration)

- Depending on community size, identify one or more storage and handling sites for woody debris. These sites may include parking lots, open spaces, or property adjacent to public right-of-ways. By establishing any agreements prior to a natural disaster, a community can respond with clean up efforts as soon as possible.
- Establish a tree debris chipping and clean up plan before a natural disaster strikes. Remember that people will tend to utilize this service to clean out household debris and remove trees and vegetation not impacted by the storm. Establish firm guidelines and rules, and make sure the public is aware of them.
- Anticipate the appearance of fly-by-night "arborists" or tree care experts that tend to show up in communities after disasters. Often times these individuals damage trees more than the storm through improper pruning and care techniques. Advise homeowners of this problem, and provide information on how to identify and hire a professional arborist.
- Clean up may take much longer than anticipated, especially after a large storm. Take advantage of media opportunities to educate the public on proper tree care after storms, chipping schedules, use of wood chips, avoiding fly-by-night "arborists", and other tree-related topics.
- Provide technical assistance to residents on the repair and care of trees after a natural disaster through local community workshops. People will want to plant new trees and repair damaged ones, and they will need technical assistance to get it done right.

5.5 Long-Term Effects of Natural Disasters--The Regreening Process

Regreening after a natural disaster is a long term process that will take many years for trees to grow and for a mature urban forest to become re-established.

Unfortunately, a mature urban forest can be destroyed in a matter of minutes or hours when a disaster strikes. To regreen that community to its original condition will take years for the trees to grow and mature. Factors to consider in regreening process include:

- After clean up efforts are complete, communities should survey for available planting spaces on public lands, and begin planning for replanting. Depending on the number of sites available, the size of the

community, and the forestry budget, a community may not be able to replant lost trees in one season. Communities are encouraged to develop a planting plan to address planting needs over a long period of time.

In fact, depending on the total number of trees lost, it may not be wise to completely replant an area without any trees in one year, because an even-age stand of trees may result. By spreading planting efforts over a number of years, a more diversely-aged stand will result.

- Tree planting, regreening and Arbor Day Ceremonies may be a welcome event after a natural disaster. Residents may see these ceremonies as a sign of hope for the community after a natural disaster.
- Educating the public on choosing the "right tree for the place " is crucial during regreening efforts. Communities can use this time as an opportunity to avoid problems of the future from poor species selection and improper planting techniques. (Refer to Appendix--B, "The Right Tree for the Right Place" in Chapter 3 for additional information.)

Benefits of Trees

Every day we receive many benefits from trees. These benefits may be direct or indirect. When pursuing funding for tree planting, maintenance or mitigation activities, it is important to emphasize the many benefits we receive from trees every day. For example, in the summertime many of us will park our cars under shady trees, walk on the shady side of a street, or have a picnic under the cool shade of a large park tree. In the autumn, many of us will take special drives to view the beautiful colors of tree leaves as they turn red, yellow, orange, and brown. We especially appreciate the color of evergreen trees in the wintertime. In the spring, we view the splendor of the flowering trees and anxiously await the breaking of buds and the coming of leaves. The presence of trees around homes can help increase property value- in fact, wooded lots tend to sell faster than open lots. When planted in the proper location, trees can help decrease summer cooling bills, and winter heating bills. Trees have also been found to have a healing effect on people, psychologically and physically. With the increasing awareness of the benefits of trees, people will realize the importance of maintaining the health of existing trees, and the desirability of planting new trees. The benefits we receive from trees can be listed according to the following categories.

Psychological Values: Trees often help reduce the stress associated with urban settings by creating feelings of relaxation and well-being. In fact, hospital surgery patients looking out the window at trees and vegetation had fewer complications, needed less medication, and had shorter hospital stays than people whose rooms

faced buildings (Ulrich, 1984). People prefer trees and environments with natural vegetation to those without. Communities with tree-lined streets and downtown areas tend to be recognized as areas with high quality of life standards and high civic pride.

Economic Values: An important point to note about trees is that as a public expenditure, trees represent an investment that appreciates in value. All other public expenditures, including sidewalks, sewers, streets, etc., depreciate in value over time.

Property values of homes with many trees in comparison to homes lacking trees tend to be higher; in fact, lots with trees tend to sell faster than lots without trees.

Properly planted trees can reduce air conditioning needs and costs during the summer, and heating costs in the winter. In fact in one study, the values for an "average" 50 year old tree are as follows: air conditioning worth \$73, soil erosion and stormwater worth \$75, wildlife shelter worth \$75, and air pollution control worth \$50--a total of \$273 (in 1985 dollars). A value of \$57,151 was also estimated for the total value of the tree during its lifetime (compounded at 5 percent for 50 years) (Ebenreck, 1989).

Aesthetic Values: Trees provide a variety of aesthetic values including: providing pleasant scenery; screening unpleasant views and odors; accenting the architectural design of buildings; and providing landscapes that promote tourism. Because trees are living and growing features in the landscape, their beauty changes with the seasons and is dynamic and ever-present.

Architectural Functions: According to McCullen and Webb (1982), trees can be used architecturally in the following ways: visually completing building fronts and street frontages; providing enclosure; creating spaces by dividing large areas into smaller, more comprehensible units; reinforcing primary design by separating spaces, providing unity to diverse scenes, drawing attention to important features, emphasizing direction, and providing contrast; providing boundaries; and, controlling traffic by providing a physical barrier.

Engineering Functions: Trees can control erosion and runoff by intercepting rainfall and lessening the impact of precipitation on the ground and by stabilizing the soil with their roots. Properly located trees can control glare and reflection of headlights as well as morning and evening sunlight. Trees can reduce noises and sounds by scattering and reflecting sound with their leaves and branches. Trees can help control air pollution by removing and filtering airborne particles, emissions and other air pollutants.

Climatic Functions: Trees provide a wide variety of Climatic functions. Perhaps one of the most important is the ability of trees to provide shade from the sun's intensity and to cool the air through the process of evapotranspiration.

Amenity Functions: Trees provide wildlife habitat, recreational opportunities and educational opportunities. Diversity of flora and fauna contributes to the overall health of the environment, particularly for humans. People benefit from interactions with wildlife; in fact, people want to be able to observe and interact with wildlife. Wooded areas, such as parks, greenbelts and parkways, provide many opportunities for urban recreational activities, including picnicking, walking, bike riding, and exercising.

Educational Values: Trees and natural wooded areas provide wonderful educational opportunities for young and old. Trees near schools represent an educational opportunity for teachers to share with students the importance of trees, their ability to survive in unique environments, and the many benefits we derive from trees.

5.6 A Comprehensive Urban and Community Forestry Program

Ideal community forestry programs include aspects of both private input and public government structure. Individuals and community groups often provide the energy and enthusiasm; the government provides continuity, authority, and resources. A community forestry program exists to maintain the health of the tree resources for the safety of people to exist in it. Therefore, a comprehensive urban and community forestry program involves effective planning and management of the tree resource, providing useful information to the public about the resource, and encourages community involvement and action in its management. There are many components of an effective, comprehensive urban and community forestry program. Hanson, et al. (1987) provides the following 12 indicators of an effective tree care program.

12 Indicators of an Effective Tree Care Program

1. Tree care agency or at least a person responsible for tree care.
2. An identified budget derived from several sources. While only \$2 per capita is required for Tree City USA recognition, the national average expenditure per tree is \$2.60 (Kielbaso 1988). (Refer to the Appendix at the end of Chapter 6 entitled "How to Fund Community Forestry" for ideas

on how to establish and maintain an urban forestry program budget.)

3. A well-managed and maintained publicly owned tree resource.
4. Trained tree workers and arborists in public **and** private tree care.
5. A workable tree ordinance or regulations and guidelines.
6. Annual work plans for public tree care.
7. Developing or working under a master plan that involves all major city infrastructure.
8. Initial and continuing participation in new developments and growth areas.
9. Inventories or assessments of the tree resource.
10. Education and outreach to citizens, school children, teachers, and political and city leaders.
11. Citizen and leader participation in planning and implementing tree care programs and events.
12. Media involvement and coverage of forest conditions, tree care activity, and citizen involvement and recognition.

Community Tree Care Through Combined Efforts

An approach for smaller communities and communities with limited tree care budgets for management, is to combine the efforts of two or more communities. Professional consulting foresters are available to assist communities at any level, from simple identification and recommendation of trees that need to be removed or pruned to prevent liability, to an inventory of the entire community forest resource, and subsequent development of a long-range management plan.

Another approach for communities would be to combine forces for tree care with one or more other communities. For example, a professional forester could be hired to care for two different communities. The forester may work three days in one community, and two days in the other. Another example would be the sharing of equipment. One community may own a high-ranger vehicle, and another community may own a chipper truck. Together these communities could work out tree removal and pruning schedules, and share the equipment, thus keeping equipment costs low.

Adequate tree maintenance can be done in every community, large and small. To achieve it, though, may require innovative thinking, and the breaking down of traditional standards and rules that limit creativity. As long as people work together cooperatively to achieve the goal of a healthy, well maintained, and safe urban and community forest, much can be accomplished.

In the April/May 1993 issue of *Urban Forests*, Phillip D. Rodbell provided a caveat or warning about the need to carefully plan for tree planting after a natural disaster. Based on the findings and discussions of many meetings held throughout the United States in 1992, the National Urban Forestry Council concentrated on 11 key issues. One which pertains to *Regreening The Community* is quoted here for consideration by the readers of our manual. **"There is a lack of planning for urban forestry needs after a natural disaster. Local officials should delay replanting efforts until adapted or appropriate tree stocks are available."**

However, based on practical experience and user interviews, we found that the survivors of natural disasters are interested in replanting their community streets and backyards as soon as possible. Perhaps there is a compromise between Rodbell's caution and the general public's wishes. While initial regreening takes place and a reasonable number of commemorative trees are planted, a detailed tree inventory of existing and needed municipal trees should be accomplished. (Most small communities have not recorded when and where earlier trees were planted.) When the tree inventory has been completed and analyzed, municipal officials and advisory groups can then determine what is needed to rebuild the urban forest. Further, plans can be made regarding budgets and availability of required trees.

Urban and Community Forestry Awards and Recognition

The USDA Forest Service and the National Association of State Foresters, in cooperation with the National Arbor Day Foundation, encourage communities to meet and hopefully exceed the standards of Tree City USA. These standards can also be put to good use to reforest communities affected by natural disasters. Four standards exist that must be met to achieve Tree City USA status. (Refer to the Appendix entitled "Tree City USA: Foundation for Better Tree Management" at the end of this chapter for more information.) More than a thousand towns and cities, large and small, have gained Tree City USA status. The standards are definitely achievable and are as follows:

Tree City USA Standards

Standard *A Tree Board or Department--*Designation of a Tree Board,
1 Department, Commission, or other authority ensures that someone will be held legally responsible for the care and maintenance of trees on public property. For smaller communities with limited budgets, a volunteer tree board is often the most practical approach. These volunteer tree boards are encouraged to work with a professional forester. For larger communities and cities, it is practical to have a forestry department with salaried professional foresters. In either case, what is critical is that some group or organization with legal status will implement an annual plan to maintain and care for the publicly owned trees.

Standard *A Community Tree Ordinance--*An ordinance must be written that
2 identifies public tree care policies that must be accomplished to maintain a healthy and safe urban forest.

Standard *A Community Forestry Program with an Annual Budget of at least*
3 *\$2 per capita--*A wide variety of tree care activities (planting, pruning and removal) must be completed to ensure the health and quality of a community's urban forest. An adequate tree care budget is necessary to maintain a healthy community tree population. **The \$2 per capita is a minimum standard to meet; many communities exceed the \$2 per capita requirement.**

Standard *An Arbor Day Observance and Proclamation--*Perhaps one of the
4 easiest and most enjoyable standards, the annual Arbor Day Observance and Proclamation, will promote awareness and support for the community forestry program.

By meeting the above standards, communities will have the structure for a community forestry program that adequately maintains trees, promotes awareness and appreciation of trees, and demonstrates a commitment to the health and quality of the existing or replanted urban forests. Storm damaged communities are encouraged to achieve Tree City USA status (if they have not already done so).

Tree City USA Growth Award

Current Tree City USA communities are encouraged to achieve the newly established Tree City USA Growth Award. The USDA Forest Service and the National Association of State Foresters, in cooperation with the National Arbor Day Foundation, also encourage the achievement of the Growth Award. The

Growth Award recognizes higher levels of accomplishment of tree maintenance goals. To be eligible for the Growth Award, your community must have Tree City USA status for a second consecutive year, spend at least as much in its annual tree care budget as the previous year, and earn at least 10 or more points in the following Growth Award Eligible Activities. (Refer to the Appendix entitled "Tree City USA Growth Award" at the end of this chapter.)

- Category A** *Education and Public Relations*--Eligible activities range from the distribution of educational materials and publications relating to community forestry, to the training and continuing education of tree workers, forestry managers, tree board members, and youth.
- Category B** *Partnerships*--Eligible activities include: Accomplishing new projects or organizations through partnerships with utilities, members of the green industry, and other communities; obtaining external funding for projects; tree planting on private property; and coordinating tree projects and engineering, forestry, and land use planning.
- Category C** *Planning and Management*--Eligible activities include: Tree inventories; management plans; improved tree ordinances; improved or newly adopted standards and specifications for trees complementing the tree ordinance; achieving a budget line item in the city budget for tree maintenance; developing or protecting wildlife habitat, park or open space; and, developing or significantly improving a tree-care disaster plan.
- Category D** *Tree Planting and Maintenance*--Eligible activities range from special tree planting and pruning projects, hazard tree assessments, and vegetation recycling programs--to special programs that eliminate destructive tree care practices and establishing a long-term contract with a nursery that ensures increased variety of species available for tree planting.

The *Tree City USA* and the *Tree City USA Growth Awards* are national level awards available to every community. Also, remember that a variety of specific state-level awards may be available to communities. These are offered by conservation, natural resources, economic development, and other state agencies, state urban and community forestry councils, and state professional forestry societies.

5.7 For More Information:

References:

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Ulrich, R. S. 1984. *View through a window may influence recovery from surgery*. Science (224):420421.

Creating an urban oasis. Missouri Department of Conservation. Video, 20 minutes.

Trees, please! Pekin Illinois/Illinois Department of Conservation. Video, 15 minutes.

American Forests
P.O. Box 2000
Washington D.C. 20013-2000
(202) 667-3300

The National Volunteer Center
1111 North 19th Street, #500
Arlington, VA 22209 (703) 276-0542

National Arbor Day Foundation
100 Arbor Avenue
Nebraska City, NE 68410
(402) 474-5655

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Chapter 5

Appendix A



Bulletin No. **34**
James R. Fazio, Editor

How to Fund Community Forestry

Community forestry programs require more than enthusiasm and dedication. They require technical skills, modern equipment, time, and materials - not the least of which is planting stock. All bear a cost. But throughout America, communities are finding ways to pay. Cost, or lack of money, should never be considered a barrier to more trees and better care.

It has been
said with
eloquence,
with statistics,
and in words

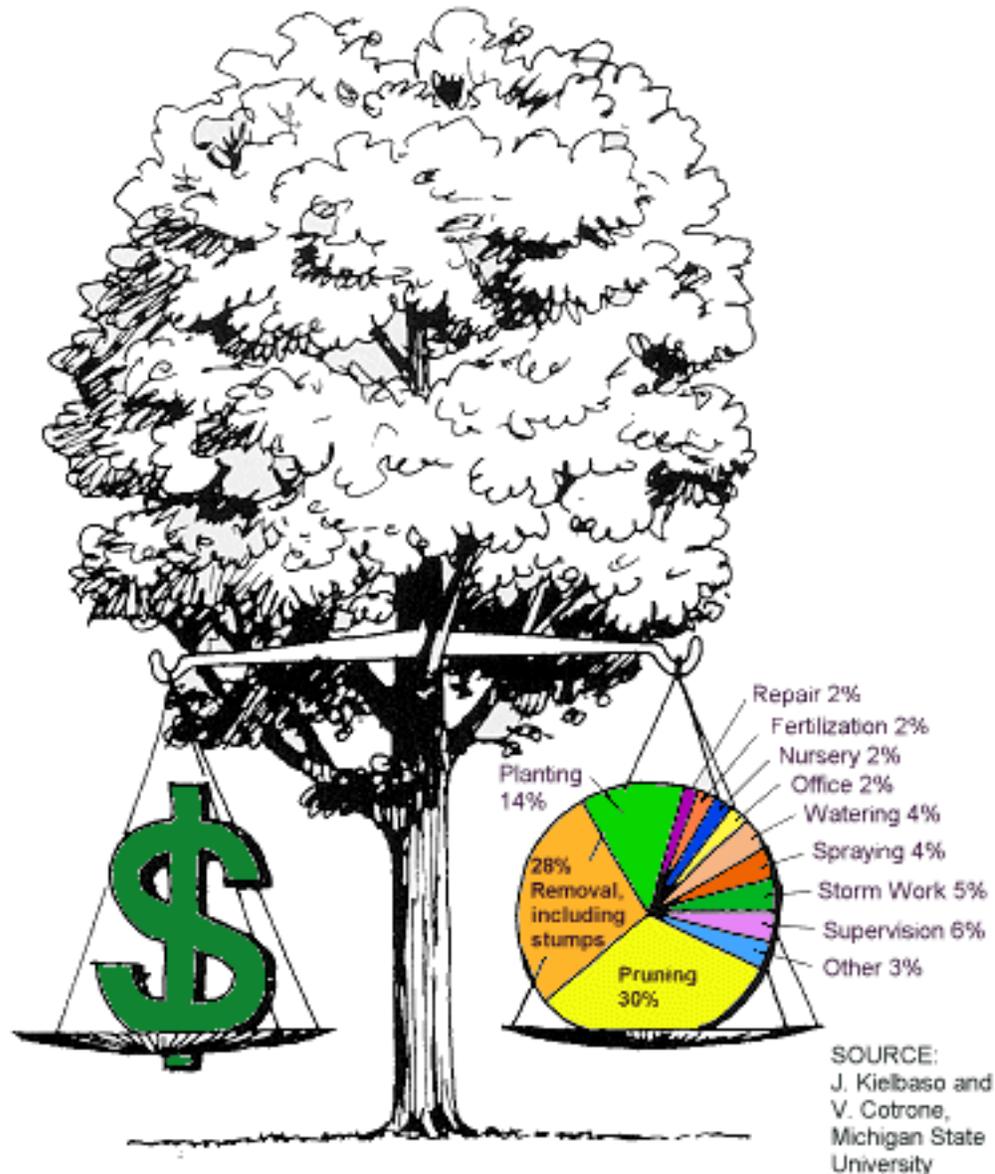
as plain as "there's no free lunch." Any way you look at it, there is no escaping the fact that all good things have a cost. Trees are no exception. If we want the benefits and the contributions that trees make in our communities, we must find ways to pay the price.

It has been estimated that municipalities with forestry programs spend between \$8 and \$11 per tree each year.

The graph on this page

developed by J. James Kielbaso and Vincent Cotrone of Michigan State University shows the array of expenditures necessary to protect a community's green assets. The figures are for public trees only, including those on streets (61%) and in parks (26%), cemeteries (2%), city-owned nurseries (2%), and other public property (9%).

Kielbaso and Cotrone also estimated the total value of the nation's street trees at some \$30 billion. Add to that the economic advantages of energy savings, pollution control, enhanced shopping areas, and higher property values, and it clearly illustrates the need for investing in tree care. On top of that we must plant more trees as cities grow and older trees die.



Every community faces the problem of finding ways to balance income with the costs of tree care.

Fortunately, the citizens and leadership of this nation are responding to the need to fund tree programs. In the past decade unprecedented funding has been made available for this purpose. From local donations to major federal grants, dollars are available to fund community forestry.

In the following pages, some of these funding methods are highlighted. This is not a complete guide, but it can serve as a starting point for anyone not familiar with the variety of sources available to assure trees for the future.

Federal Assistance for Urban Trees

In the world of trees, the '90's will be remembered as the beginning of significant federal financial support for urban and community forestry. Action at the federal level has provided unprecedented opportunities to fund tree projects. Although application details- and dollars available- often change on an annual basis and from state to state, here are examples of federal programs worth exploring.

A Premise: There is No Substitute for Local Support

Ultimately, community trees are a local responsibility. Federal assistance, state assistance, donations, and special grants are currently providing important help for planting trees and establishing community forestry programs. But no source of funds should be considered a substitute for including tree replacement or care in local municipal budgets. Abundant, healthy trees are of value to the entire community. A forestry program is as much a municipal responsibility as streets and fire protection. Incorporating trees into the mainstream of municipal fiscal responsibility should be a goal in all strategic

planning for the future of trees in America.

- John Rosenow
The National Arbor Day Foundation

Urban and Community Forestry Assistance Program

Thanks to a provision in the Food, Agriculture, Conservation, and Trade Act of 1990 ("Farm Bill"), state governments nationwide have received financial assistance to establish or strengthen community forestry programs. The funds enable the hiring of urban and community forestry coordinators and volunteer coordinators. They also include annual allocations that can be passed on to local communities. These grants must be matched on a 50-50 basis, but the local contribution can include administrative time, donated professional services, volunteer help, and donated trees. The funds can *not* be used to substitute for funds normally supplied by the municipality.

Only a small percentage of funds from this source can be used to purchase planting stock. Nonetheless, the money has provided valuable assistance for on-the-ground improvements, public education, volunteer projects, and building a commitment to long-term urban forest management. A few of the first funded projects have included:

- Brochures and other materials for public education
- Interpretive facilities
- Arboretum planning and development
- Workshops and training programs
- Seed money for hiring city foresters
- Seed money to hire volunteer coordinators
- Tree inventories and plans
- Demonstrations and special events
- Tree board establishment

Contact: Urban and community forestry staff in your State Forester's office

Rural Community Assistance From National Forests

Subtitle G, Title 23 of the 1990 Farm Bill offers a special opportunity for communities with under 10,000 population and located within 100 air miles of a national forest. Other

criteria include economic dependency on natural resources (15% of labor and proprietor income) and evidence of economic hardship due to the loss of jobs or income derived from natural resource enterprises. Funds of up to \$15,000 are available for planning (with a 20% match), and \$50,000 for implementation.

Eligible projects include:

- Improving community services
- Outdoor recreation/tourism
- Physical infrastructure/facility improvement
- Recycling
- Environmental improvement
- Technical assistance/technology transfer
- Training/education

Some national forests offer other kinds of assistance to local cities and towns that can be applied to improving the community forest. For example, in one area 50-50 matching funds for street tree inventories and planning have been offered when Forest Service employees are active in the community as volunteers.

Contact: Nearest Forest Supervisor's Office or Regional Office of the USDA Forest Service.

Small Business Administration (SBA) Funds

Here is a source of funds for the actual purchase of trees. For a number of years the SBA has offered assistance to buy and plant trees on public property. The purpose of this program is to help small businesses, so a requirement is that any purchased or donated trees must be planted by a company employing less than 100 people. A 45-55 match is also required, but contributed trees or the *pro bono* services of an architect in planning the project would count.

Contact: Urban and community forestry staff in your State Forester's office.

The National Tree Trust

The National Tree Trust was another result of the 1990 Farm Bill. Congress created the Trust with an endowment of \$20 million. This money is intended primarily for supporting

community tree organizations and projects. Municipalities and non-profit organizations can apply for assistance.

Contact: The National Tree Trust, 1120 G St. NW, Suite 770, Washington, DC 20005 (202/628-8733).

National Urban and Community Forestry Advisory Council

Still another provision in the 1990 Farm Bill established the National Urban and Community Forestry Advisory Council. The Council reports directly to the Secretary of Agriculture. Among its projects are grants for specified purposes. The focus of these grants changes annually, but has included funding for such activities as demonstration and information relative to the environmental costs and benefits of urban forests, and the development of model municipal or volunteer urban forestry programs that serve under-represented, diverse publics.

Contact: USDA Forest Service, Cooperative Forestry, P.O. Box 96090, Washington, DC 20090

Resource Conservation and Development (RC&D) Program

Here is a non-traditional source of assistance from an organization with an increasing interest in community forestry. RC&D councils are found throughout the United States. Technically, most are non-profit corporations made up of local farmers, business leaders and units of government to coordinate projects in primarily rural areas. The program is administered by the Soil Conservation Service and receives professional support from that agency. Projects undertaken are the decision of each council. Some discretionary funds are usually available to assist, but the real opportunity is that RC&D is a highly flexible organization with personnel who are masters at putting together partnerships. They have an impressive record of securing grants, donations and meeting cost-sharing requirements for the projects they select. The key point, then, is to learn about the RC&D in your area and present a convincing case for community forestry needs. Even better, volunteer to become active on the council's forestry committee.

Contact: Your local USDA Soil Conservation Service office.

FEMA - The Help You Don't Want to Need!

The Federal Emergency Management Agency is an organization you don't want to have to deal with - but it is nice to know about it, just in case. FEMA is the branch of government that steps in after a disaster area has been declared. Typically, tornados, floods and hurricanes bring FEMA to town, but its staff also responded to a vicious ice storm that did some \$97 million of damage to the trees of Monroe County, New York, in 1991.



A key to receiving maximum funds through FEMA to replace lost trees is being able to prove that your community regularly maintained and replaced lost trees under more normal circumstances. Street tree inventories are a big help, and a record of planting costs in Dade County, Florida, more than doubled the per tree reimbursement first offered by FEMA. Provisions in a tree preservation ordinance established replacement requirements based on canopy coverage (rather than one to one replacement when trees are lost). This resulted in payment for about four trees for every large tree that was destroyed.

Federal resources and other grants help, but the long-term maintenance and other mainstays of community forestry must continue to rely on local tax dollars.

For more tips about working with FEMA and being prepared before a disaster, contact American Forests (P.O. Box 2000, Washington, DC 20013) for a copy of the February/March 1993 issue of *Urban Forests*.

Be Prepared!

Sometimes the turnaround time on grant applications is very short. Therefore, it pays to know the general requirements for a particular grant, plan your project in advance, and be ready for the next cycle of application requests. In all cases, be sure your state urban and community forestry coordinator knows of your interest so forms can be forwarded directly to the right person. Asking for help in planning your request may also enhance your chances of competing successfully.

ISTEA: Cool Name for a Hot Opportunity

The acronym, ISTEA, is pronounced "ice tea" and stands for the Intermodal Surface Transportation Efficiency Act of 1991. It also stands for a good but little understood federal program that can help plant trees.

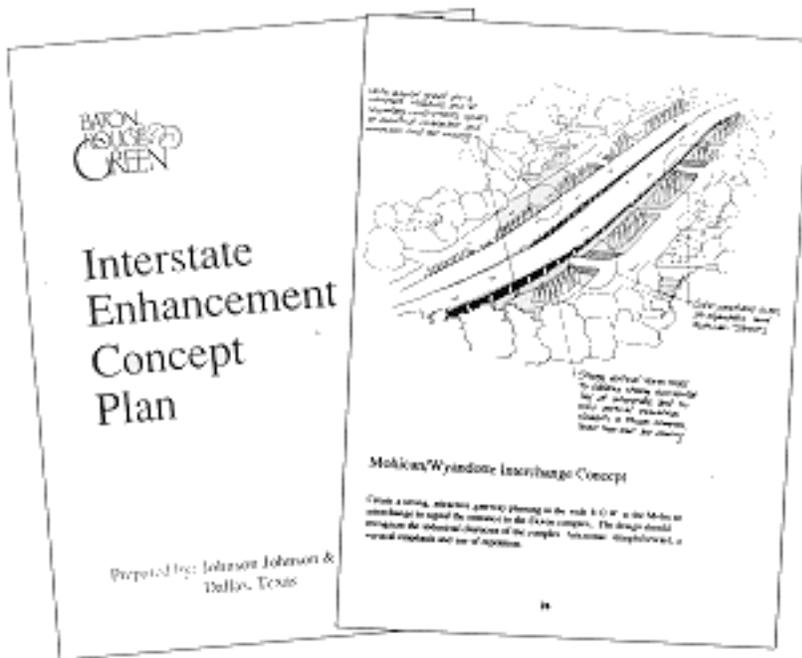
The problems with ISTEA - besides remembering its full name - are that it is relatively new, somewhat complex, and introduces some new players to the field of community forestry. As one Washington newsletter proclaimed, "The new highway bill is packed with recreation programs. \$500 million per year in 'enhancement money'...But states have been sluggish about spending the money." A state urban and community forestry coordinator put it this way: "Some state highway departments hate it. It puts added strain on their staff and they are not used to dealing with tree planting. They wish it would go away!"

Others view ISTEA quite differently. It has been called "a renewed vision for American transportation," "very flexible," and a "federal commitment to move out of the Interstate Age and into an era of balanced investment in transportation which better reflects the

social, environmental, and energy goals of the nation."

While some states have yet to fully utilize ISTEA provisions for tree planting, others have been quick to take advantage of this legislative mandate. The Nebraska Department of Roads, for example, has produced a clearly-written guide booklet to help local communities apply for ISTEA funds.

Enhancement Provision of ISTEA



ISTEA is a \$150 billion, 5-year program to improve America's highways and transportation systems. Approximately \$3.3 billion of these funds may be allocated to state highway departments under the auspices of a Surface Transportation Program. Importantly, under a section of the law called the Transportation Enhancement Program, 10 percent of that money must be earmarked for projects in the following categories:

- **Historic Attractions**

- Easement acquisition
- Historic highways
- Historic preservation
- Historic transportation facilities
- Landscaping
- Prairie restoration
- Archaeological planning

Runoff mitigation



- **Trails**

Facilities

Railway corridors

Landscaping

Runoff mitigation



- **Scenic Byways**

Easement acquisitions

Scenic highways

Landscaping

Runoff mitigation

Tree planting qualifies as part of all three enhancement categories. ISTEA can help plant trees at historic sites, and along trails, bikeways, scenic byways and elsewhere, depending on state criteria. All projects require 20% matching funds, must be maintainable, and must meet any state landscaping standards. Eligible applicants include state and local governmental agencies including park departments, public corporations, state colleges, tribal governments, and many other governmental units.

Although enhancement funds offer the best route to dollars for trees, several other provisions included in ISTEA can benefit the environment. These include mitigation of damage to ecosystems and wildlife habitat, carpool projects, and fringe parking facilities. In all, ISTEA heralds a new era to design and build transportation facilities that fit harmoniously into communities and the natural environment. In the words of a policy statement issued by the Federal Highway Administration, the need has been recognized to:

act creatively and decisively to minimize environmental degradation and protect environmental quality while enhancing lives by improving mobility.

How To Apply

States have been given an unusual amount of flexibility for developing policies to

implement ISTEA programs. However, John Barnes, planner with the Idaho Transportation Department, offers these suggestions:

1. Schedule an appointment with a representative of your state transportation department who is knowledgeable about the enhancement provisions of ISTEA. A common location for such a person is in the planning and programming section of the agency's headquarters.
2. ISTEA strongly emphasizes planning and public involvement. Become familiar with the planning process used in your state (or city, if its population is 50,000 or more). Then participate at every opportunity and insist that trees and landscaping are included as elements of any transportation or master plan. This makes it much easier to obtain funds for specific projects later on.
3. Most states have now established guidelines for project requests. Ask to see copies of these policy documents, procedural manuals, or any other publications related to the Transportation Enhancement Program and Surface Transportation Program.

ISTEA Funds Plant Trees in Baton Rouge



Randy Harris, arborist for Baton Rouge Green, inspects a Shumard oak planted with ISTEA funds to improve an interstate interchange.

As a program, ISTEA is relatively new. But Lynn Morris, executive director of the non-profit organization, Baton Rouge Green, lost no time in taking advantage of its possibilities. The result was a \$360,000 grant from the U.S. Department of Transportation and a matching \$90,000 grant from Louisiana's Department of Transportation and Development.

Louisiana's pioneering ISTEA project was dedicated to using trees and other vegetation to reduce the impact of three interstates that bisect the capital city. Baton Rouge Green put up the money for a concept plan, solicited a broad base of support for the idea - including local businesses and the director of the state transportation department - and carefully studied the criteria for receiving ISTEA enhancement funds. These criteria included making sure the project would not only improve the travel experience in Baton Rouge, but could serve as a model for use elsewhere. Other project highlights included:

- Using native trees
- Recreating natural conditions by matching trees with soil types and landforms. This resulted in diversity such as mixed hardwoods in one area, cypress and live oaks in another.
- Developing in stages. The concept plan covered future projects as well as the first one. Phase 1 was to plant 3,000 trees at six major interchanges; Phase 2 will improve inner-city loops; Phase 3 will focus on state highways that approach the interstates.

The Baton Rouge project should inspire communities everywhere to compete for ISTEA funds. And to Baton Rouge Green - a debt of thanks for what the planning firm of Johnson Johnson & Roy called a ground breaking effort in a new age of transportation planning that looks beyond pure function to a larger quality of life issues."

Local Funding: The Essential Foundation

"Trees are something we can't do without. They need to be viewed as essential infrastructure along with streets, utilities and crime prevention. A sustainable tax base is a must."

**- James Nighswonger
Urban and Community Forestry
Program Leader
Kansas**

Taxes and the Budget

Local taxes must be at the heart of support for community forestry. Trees serve important local needs and should be viewed as an essential service. Everyone who cares about trees must work together to assure that this concept is reflected in municipal government and results in an adequate amount budgeted each year as a line item.

Making the Most of Tax Dollars

The City of Milwaukee has set a good example of how trees can be even more than a "line item" in a municipal budget. This is by making trees part of all street and road improvement projects. Using this approach, a project tally may look something like this, with trees being an essential - but relatively inexpensive - part of the project.

<u>PER DOLLAR PROJECT SUMMARY</u>	
Water main	\$.245
Pavement	.223
Storm sewer	.167
Sanitary sewer	.130
Sidewalk	.074
Curb/gutter	.059
Light	.043
Turf	.037
Trees	.022
TOTAL:	\$ 1.00

Assessments and Compensations

About a dozen cities in Ohio, both large and small, fund their street tree programs with a special assessment on all properties abutting public rights-of-way. This assessment, similar to that which funds sidewalk repair, is authorized by Ohio Revised Code Section 727.011.

Check your state's codes to see if you have something similar. Cincinnati, through a 12 cent per foot assessment, generates about \$1.25 million per year, which is restricted for use on trees along its 1,000 miles of streets.

Assessments are supplemented with compensatory payments made by people who damage or remove street trees, either by accident or design. The amount of compensation is determined using the appraisal formula sanctioned by the International Society of Arboriculture (See *Bulletin* No. 28) and the money is given directly to the city forestry department for planting trees.

State and Local Tree Trusts

Every state and community should have a tree trust. This is essentially a fund that can accept private and commercial donations earmarked for tree programs. At its best, the principal is invested and never spent, with the interest used for projects and when matching money is needed for a cost-share grant. It is a method of raising funds that appeals to people who want to maximize the benefits of their donation over time. Publicity about the trust can suggest cash donations, insurance policies, property for resale, and bequests.

Sometimes trusts are established by individuals and committees for parks or general use, then forgotten as the years pass. Check with your city treasurer and local bank officials for information about existing or potential trusts.

Tax Checkoffs

Wildlife interests had this idea first, with more than 60 percent of all states now letting taxpayers donate from their tax refunds or add to their tax payment. Minnesota raises more than \$1 million a year in this way for its nongame wildlife program. Tree interests are following the example. In predominantly rural Idaho, \$4,500 was raised during the first year of its checkoff system, even with no advance publicity.

Utility Bill Donations

From Austin, Texas, to Shelby, Ohio, another "painless" way is being used to let citizens donate to assure trees for the future. In some cases, a specific amount (15 cents, for example) is added to each utility bill. If a resident wants to pay, he/she voluntarily includes it in the payment.

Another method is to ask bill payers to round the amount due to a higher figure of their choice. Thousands of dollars are raised in this way and used for special tree projects. All it takes is the cooperation of your local utility.

Memorials and Honors

At times of loss and times to celebrate, the question is often: "How best to remember special people?" In Greensboro, North Carolina, Greensboro Beautiful provides the answer for all occasions. The system is simple. A well-publicized program is in place so anyone may purchase a tree to memorialize or honor someone at any time. \$35 buys a listed tree; \$50 will purchase a larger one or one not on the list. The donor can suggest a location or designate "where needed." \$100 buys an arboretum tree. There is even a general pool for those who prefer. Notification of the bereaved or honored is sent, as appropriate.

Bake Sales, Auctions...



Fund raising is limited only by the imagination. The City of Boise, Idaho, "sells" public rest benches with engraved labels. The benches are sawn from street tree removals. Other cities sell firewood, or even lumber. Volunteers set up tables at fairs and shopping malls to sell perennial bulbs, cookies, trees, you name it. A cleaning establishment donates 1 cent per hanger returned, gaining from it great publicity, a way to recycle hangers, and dollars for trees. And in England, *The Financial Times* lined up more than 50 famous artists and personalities to donate paintings, drawings, sculptures or photographs of "my favourite tree" for an auction. Funds went to the Countryside Commission to plant trees east of London.

To Stretch Dollars

Here are some of the ways communities are maximizing funds available for tree programs:

- Several small Midwest communities pool resources to hire a shared forester. Other contracted services and equipment purchases can be obtained in this way.
- *Feed the Oaks* is a project in Covington, Louisiana, that asks residents for contributions to help fertilize and otherwise care for the city's 199 live oaks. Other

options include adopting one of the oaks or volunteering to plant trees.

- Cincinnati makes 1,000 free, 1 1/2 inch caliper trees available each spring. Residents and organizations apply for the trees and suggest planting locations. The sites are checked and 1,000 lucky recipients are selected. What the city saves in planting costs allows more to be spent on trees.
- The Northwest Urban Forestry Council in Kansas provides nurseries with rebate tags to place on selected species. Offers of a 50% refund, with a \$15 maximum, not only encourage the planting of more trees, but assures that trees adapted to northwest Kansas are used.
- Plantation, Florida, has an exemplary cost-sharing program for any resident who would like to plant a street tree. The resident pays half the cost (about \$45 per tree); the city plants, initially waters, and guys the tree. Detailed instructions for guy removal and other procedures are provided to residents on a door knob hanger.
- In many communities, cooperation with the local utility makes tree planting inexpensive through either cost-sharing or providing the tree free. The advantage to the utility, besides good publicity, is that it can control species selection and make certain that appropriate trees are planted beneath or near overhead lines.

Innovating for the Future

From the complex world of air quality modeling and the innovative mind of a park superintendent comes a new mechanism that may: (1) better quantify the value of trees, (2) reduce air pollution, (3) reduce pollution control costs for industries, and (4) provide a way to fund an expanded urban forestry program.

Too good to be true? That's what the U.S. Environmental Protection Agency has decided for the time being, but they have also encouraged Bailey Hudson of Santa Maria, California, to keep working on his idea.

Currently, "emission reduction (tax) credits" are granted to businesses to help offset the cost of installing mechanical devices that capture a specified amount of pollutants generated by the business. At the same time, researchers are trying to quantify the amount of specific pollutants that *trees* remove from the air. When knowledge of this phenomenon is perfected, the service performed by trees can be given a

dollar amount (by comparing it with the cost of mechanical pollution control devices or the willingness of citizens to pay for clean air).

Bailey's plan is to then get EPA permission to give businesses the option of either using mechanical devices to prevent pollution, or providing funds to the city for tree planting and care.

More details are available in the August 1993 issue of *Arborist News*. Yankee ingenuity is alive and well!

Other Sources of Information

Tree City USA Bulletin will inform readers about helpful, up-to-date materials that provide more depth, serve as good models, or are readily available for community distribution. The editor welcomes sample copies to consider for inclusion in revised editions of this and other *Bulletins*.

Computing Costs and Benefits

A new program has been developed to help you calculate quantifiable costs and benefits of community trees. Information about a community's trees is combined with variables such as air pollutant concentrations, local utility rates, and tree maintenance costs to arrive at the net value of trees in a community. This is an exciting new tool to help justify forestry budgets and educate residents about the value of the community forest. Available in hard copy or computer format. For information, contact:

Research Trust
International Society of Arboriculture
P.O. Box GG
Savoy, IL 61874-9902
(217) 355-9411

Booklet

- *A Summary - Environmental Programs and Provisions, Intermodal Surface Transportation Efficiency Act of 1991*

Federal Highway Administration
Attn: Noreen Bowles
Environmental Analysis Division, HEP-42
400 7th St., S.W.
Washington, DC 20590

As the title implies, this brochure summarizes the various provisions of ISTEA that relate to environmental protection and enhancement. This and any other current literature obtainable through the above contact would be good "homework" before pursuing ISTEA funds.

Videotape

- *Urban Forestry (National Version)*

Michael J. Walterscheidt
Texas Agricultural Extension Service
302 Horticulture and Forest Sciences Bldg.
College Station, TX 77843
(409/845-1351)

There are lessons in this 25-minute video for anyone looking for ways to fund an urban forestry program. The video begins with an explanation of urban forestry, then uses five Texas communities of various sizes to illustrate how funding was put together for tree programs. Price: \$12 ppd. Make checks to: "TEXFAC Account #235000."



Arbor Day Fundraising Kit

A program is available from The National Arbor Day Foundation that gets trees planted and can put money in the coffers of any organization. Groups can solicit tree orders, earning a 35% profit on each tree sold. Trees are shipped directly to the purchaser. Species include: red maple, black walnut, weeping willow, sugar maple, redbud, thornless honeylocust, tuliptree and pin oak. For free information, including a sample sales kit, send your name and address to: Fund-Raising Trees, The National Arbor Day Foundation, Nebraska City, NE 68410.

Ideas Through Networking

Many of the best funding ideas in community forestry -including how to compete for local tax dollars - come from what is being successfully used elsewhere. An excellent way to get these insights is to attend conferences and training sessions. For a free schedule of upcoming conferences and workshops sponsored by The National Arbor Day Foundation in Nebraska City or elsewhere throughout the United States, write: Conference Schedule, The National Arbor Day Foundation, Nebraska City, NE 68410.

Related *Tree City USA* Bulletins

Previous issues of the *Bulletin* that contain additional tips or information related to funding urban and community forestry include:

No. 16: How to Recycle Shade Tree Materials

No. 18: Tree City USA Growth Award

No. 19: How to Select and Plant a Tree

***No. 22: Tree City USA: Foundation for Better Tree Management
- 1992 Annual Report and Directory***

No. 28: Placing a Value on Trees

***No. 29: How to Plan for Management
- 1993 Annual Report and Directory***

For a complete listing of *Tree City USA Bulletin* titles, write The National Arbor Day Foundation, 100 Arbor Ave., Nebraska City, NE 68410.

How to join the Friends of Tree City USA...

To receive a subscription to the *Tree City USA Bulletin*, and to become more involved in the community forestry movement in your town and throughout America, send a \$10 dues-donation to Friends of Tree City USA, The National Arbor Day Foundation, 100 Arbor Ave., Nebraska City, NE 68410. Make your check payable to "The National Arbor Day Foundation."

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The
National
Arbor Day
Foundation
100 Arbor Avenue
Nebraska City, NE 68410

Return to: [Chapter 5 - Regreening the Community](#)

Chapter 5

Appendix B



Bulletin No. **22**
James R. Fazio, Editor

**Tree City USA:
Foundation for Better Tree Management**

**When
a**

WAUKESHA PARK AND RECREATION DEPARTMENT

CITY HALL, 261 DELAFIELD ST., WAUKESHA, WIS. 53188-3686, PHONE 414-524-3737, FAX 414-524-3888



W. R. OLIVER, Director

Mr. John Rosenow, Executive Director
The National Arbor Day Foundation
100 Arbor Avenue
Nebraska City, NE 68410

Dear Mr. Rosenow:

On May 10, 1990, Waukesha experienced a devastatingly spectacular freak snow storm. This 9-inch, wet, heavy snowfall, accompanied by high winds, occurred just after full leaf-out. Sixty percent of our 30,000 street trees sustained damage and 1,000 required removal. Currently we are making steady progress with our corrective repair and maintenance work.

To accomplish this enormous restoration task we approached the City's finance committee for emergency funds. After our presentation to the committee, the initial and immediate response of the chairperson was, "We are a Tree City USA, we are proud of the designation and we intend to keep it." The vote was unanimous in favor of all our requests.

My point here (and I can not emphasize this enough) is that our designation as a Tree City USA was a tremendous positive influence in securing the support for necessary repairs and the continuation of Waukesha's urban forestry programs.

I will close by simply saying to others, if you are not a Tree City USA now - become one; if you are already - sustain the title. The benefits to be accrued are manifold, take my word for it!

Respectfully submitted,

David P. Liska,
City Forester

community becomes a Tree City USA, it means more than being able to display a road sign or fly the Rag. Tree City USA is a foundation for effective, well-organized tree care programs. Along with the community pride are practical benefits such as helping to gain financial support for tree projects, contributing to safer and healthier urban forests, and allowing municipal officials to deliver better service to the voting public.

A letter from the city forester in Waukesha, Wisconsin, illustrates one of the many advantages of being in the network of Tree City USA communities. Since its inception in 1976, Tree City USA has become a program of incalculable value to the welfare of the nation's urban and community forests.

Originally, this program of The National Arbor Day Foundation and its cooperators was to recognize cities and towns that are effectively managing their trees. By establishing four basic standards that must be met to become a Tree City USA, the goal was also to encourage the implementation of well-planned local forestry programs.

In most of the communities it serves, Tree City USA has been successful in meeting these goals. And with success has come the kind of local support described so well by David Liska. It has also led to support from outside sources, as revealed by others in this issue.

Benefits of Being a Tree City USA

"Being a Tree City USA has challenged us to set long- and short-term goals and enabled all facets of our community to work together as a unit. We are more aware of, better educated about, and taking steadfast control of our environment."

**-Vicki Gottlob,
City Tree Board Member
Cook, Nebraska (Pop. 339)**

"With a municipal deficit of over \$3 million, Cleveland's Division of Urban Forestry held its own during 1991. Politicians are eager to reward those agencies that achieve national acclaim for their efforts. For us, Tree City USA has made the difference between an ordinary and an extra-ordinary program."

**- Ralph Sievert, City Forester
Cleveland, Ohio (Pop. 500,000)**

Every community, regardless of size, benefits in a different way from being a Tree City USA. Reports of these benefits have reached The National Arbor Day Foundation through the years and are summarized below in six general categories:



Annual, systematic tree care is essential in a good community forestry program.

Framework for Action

Meeting the four standards for becoming a Tree City USA provides initial direction for an urban or community forestry program. Like the first rungs on a ladder, the standards help get a community started toward annual, systematic management of its tree resources.

Education

Education begins with discussion of the standards and getting organized to apply for Tree City USA status. It continues as the desire for Tree City USA recognition leads to contacts with the state forester's staff. In turn, this can set in motion aid from a variety of professionals in the form of technical advice, literature, films, and other assistance.



Applying for Tree City USA recognition puts a community in touch with experts who can help with technical advice.

Public image

A community's public image is a very real phenomenon and important in many ways. Being a Tree City USA helps present the kind of image that most citizens want to have for the place they live or conduct business. The Tree City USA entrance signs along public highways tell visitors that here is a community that cares about its environment. It is also an indication to prospective businesses that the quality of life may be better here. It has even been known to be a factor in where meetings or conferences have been held. This reason alone caused a motel owner to start action for his community to join the network!



Being a Tree City USA helps shape an attractive community image.

Citizen Pride

Pride is sometimes a less tangible benefit. Gaining and retaining Tree City USA recognition is an award to the tree



A Tree City USA award instills a sense of pride among volunteers, staff and residents.

workers, managers, volunteers, tree board members and others who work on behalf of better care of a community's trees. Non-involved citizens, too, often share a sense of pride that theirs is a Tree City USA. This may translate to better care of trees on private property or a willingness to volunteer in the future.

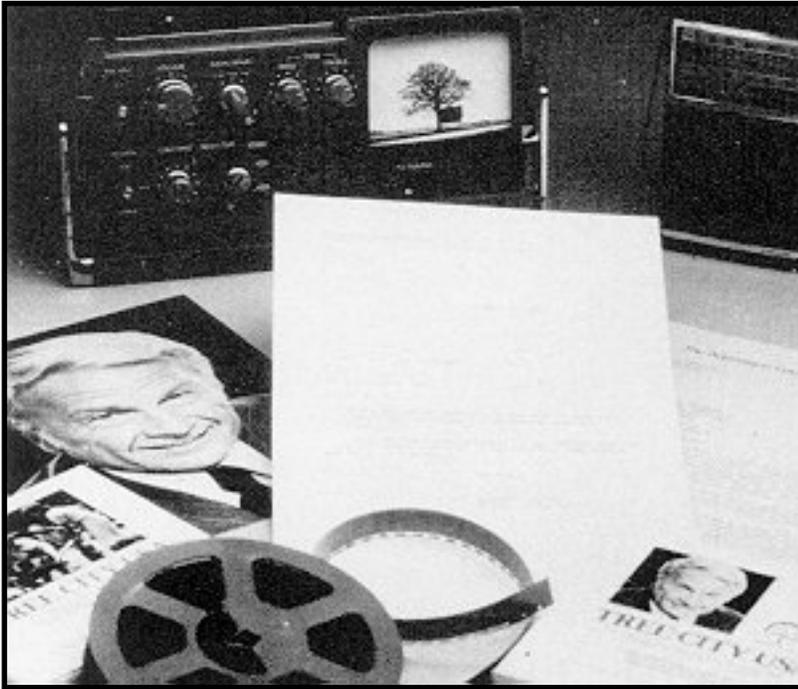
Financial Assistance

Preference is sometimes given to Tree City USA communities over other communities when allocations of grant money are made for trees or forestry programs. The reason is that there are invariably more requests than available funds when grants are available through state or federal agencies. If requests are equally worthy, some officials tend to have more confidence in communities that have demonstrated the foresight of becoming a Tree City USA.



Funding assistance for new trees sometimes goes first to communities with Tree City USA recognition.

Publicity



Assistance is available to help publicize Tree City USA awards and ceremonies.

Presentation of the Tree City USA award and the celebration of Arbor Day offer excellent publicity opportunities. This results not only in satisfaction for the individuals involved and their families, but also provides one more way to reach large numbers of people with information about tree care.

As one forester put it, "This is advertising that money can't buy - and it is free."

How to Become a Tree City USA

Steps to Becoming a Tree City USA

1. Obtain an application form from your state forester or The National Arbor Day Foundation.
2. At this point, a community may find that it meets the standards and can proceed with the application. If, on the other hand, it discovers it has additional work to do, the next step should be to seek help from the state forester's office.
3. When your community meets the four standards, have the one-page application and supporting materials submitted to your state

- forester by the mayor or other city official no later than December 31. There is no fee.
4. Verification and approval is done by staff in the state forester's office and the application is forwarded to The National Arbor Day Foundation. Communities receiving final approval are notified by February 15.
 5. State foresters present the Tree City USA awards in various ways. Most commonly, the awards are given at an Arbor Day ceremony in the community or at a statewide awards program, usually in the state capitol and sometimes with participation of the governor. Community officials receive a Tree City USA flag, two road signs, a plaque and several commemorative items.
 6. Recertification announcements are sent to communities annually, as well as an application for a Tree City USA Growth Award. The Growth Award encourages continual improvement of community forestry programs (See Bulletin No. 18).

The Four Standards- How to Put Them to Work

To qualify for Tree City USA, a town or city must meet four standards established by The National Arbor Day Foundation and the National Association of State Foresters. These standards were established to ensure that every qualifying community would have a viable tree management plan and program. Importantly, they were also designed so that no community would be excluded because of size.

1. A Tree Board or Department

Someone must be legally responsible for the care and management of the community's trees. This may be a professional forester or arborist, an entire forestry department, or a volunteer tree board. Often, both a professional staff and advisory tree board are present, which is a good goal for most communities.



A tree board, or commission, is a group of concerned volunteer citizens charged by ordinance with developing and administering a comprehensive tree management program. Balanced, broad-based community involvement is encouraged.

The Tree City USA flag is a symbol of public pride.

Boards function best if not composed entirely of tree-related professionals such as forestry professors, nursery operators, arborists, etc. Fresh ideas and different perspectives are added by citizens with an interest in trees that is entirely avocational. Limited, staggered terms of service will prevent stagnation or burn out, while at the same time assuring continuity.

2. A Community Tree Ordinance

The tree ordinance must designate the establishment of a tree board or forestry department and give this body the responsibility for writing and implementing an annual community forestry work plan. Beyond that, the ordinance should be flexible enough to fit the needs and circumstances of the particular community.

A tree ordinance provides an opportunity to set good policy and back it with the force of law when necessary. Ideally, it will provide clear guidance for planting, maintaining and removing trees from streets, parks and other public places.

For tips and a checklist of important items to consider in writing or improving a tree ordinance, see Bulletin No. 9.

3. A Community Forestry Program with an Annual Budget of at least \$2 Per

Capita

Evidence is required that the community has established a community forestry program that is supported by an annual budget of at least \$2 per capita. At first, this may seem like an impossible barrier to some communities. However, a little investigation usually reveals that more than this amount is already being spent by the municipality on its trees. If not, this may signal serious neglect that will cost far more in the long run. In such a case, working toward Tree City USA recognition can be used to re-examine the community's budget priorities and re-direct funds to properly care for its tree resource before it is too late.

Ideally, this standard will be met by focusing funding on an annual work plan developed after an inventory is completed and a report is approved by the city council. Such a plan will address species diversity, planting needs, hazardous trees, insect and disease problems and a pattern of regular care such as pruning and watering.

4. An Arbor Day Observance and Proclamation

This is the easiest and probably the most enjoyable standard to accomplish. An Arbor Day celebration can be simple and brief or an all-day or all-week observance. It can be a simple tree planting event or an award ceremony that honors leading tree planters. For children, Arbor Day may be their only exposure to the green world or a springboard to discussions about the complex issues of environmental quality.

The benefits of Arbor Day go far beyond the shade and beauty of new trees for the next generation.

How You Can Help Tree City USA

More than 1,400 communities ranging in population from a few hundred to over one million have been awarded Tree City USA status. The results touch the lives of some 70 million people who live in these towns and cities. You can help these numbers grow.

If you are not a resident of a Tree City USA, follow the steps on page 4 to help your community achieve this distinction.

If You live in a Tree City USA, let your mayor and city council know you support the community forestry program and hope to see it maintained and strengthened in the years ahead. You can also make an important contribution by encouraging other communities to become a Tree City USA. Simply write for additional copies of this issue of the

Arbor Day is a golden opportunity for publicity and to educate homeowners about proper tree care. Utility companies can join in to promote planting small trees beneath power lines or being careful when digging. Smokey Bear's fire prevention messages can be worked into the event, as can conservation education about soil erosion or the need to protect wildlife habitat.

Bulletin and the booklet, *Keep A Great Thing Growing America, Tree City USA* (See page 8). Send these to friends or municipal officials in non-Tree City USA communities along with your personal recommendations.

Still another way to develop Arbor Day is to link it with a tree-related festival. Some that are currently celebrated include dogwood festivals, locust blossom festivals and Macon, Georgia's Cherry Blossom Festival that annually brings more than \$4.25 million into the local economy.

In meeting the four standards, help is available! The urban and community forestry coordinator in your state forester's office will be happy to work with communities in taking these first steps toward better community forestry.

Meet Mary Yager: Tree City USA Coordinator

When you write or phone The National Arbor Day Foundation with questions or information about Tree City USA, here is the person who is always happy to hear from you. One of Tree City USA's most enthusiastic supporters, Mary Yager has been at the helm of this program since 1988.

Officially, Mary's title is Director of Program Services. In this role she receives the applications from state foresters, reviews them for completeness, irons out problems



and updates the records. Once an award is approved, Mary forwards the recognition items to the state forester and a publicity kit to the community. This is often followed by fielding inquiries from the local media for additional information about the Tree City USA program.

Mary's other duties include coordinating the National Arbor Day Awards competition, promoting Arbor Day through the mass media each spring and distributing the Foundation's popular public service announcements to the nation's print and electronic media.

Questions about any of these programs are always welcome. You can contact Mary at 402/474-5655.

Tree City USA and Community Forestry: The Role of Urban and Community Foresters

From the inception of the Tree City USA program, its success can be credited to an active partnership between the USDA Forest Service, National Association of State Foresters and The National Arbor Day Foundation. The USDA Forest Service has consistently provided financial assistance and technical advice, the state



The Foundation, cooperating organizations, and the nation's media work together to educate the public about the value of community forestry and Tree City USA through print and broadcast public service advertising.

single or multi-county responsibility. Whatever the administrative structure, the common goal is to promote better management and health of the state's urban and community forests.

foresters have, provided local assistance as well as serving as key promoters, certifiers and coordinators in each state, and the Foundation provides educational materials and management of the cooperative venture. In addition, hundreds of professionals and volunteers work together on behalf of Tree City USA, and the program is endorsed and promoted by the U.S. Conference of Mayors and the National League of Cities.

Looking into the future, the key individuals for making the program grow are the state urban and community forestry specialists. This cadre of professional men and women has expanded in recent years in response to greater emphasis on community trees and their role both in local environmental quality and environmental well-being on a global scale. Some states have a single coordinator; others have a staff in one central location; and others have individuals scattered through the state with

Tree City USA has proven to be an excellent way to help achieve this goal, so it is no surprise that many urban and community forestry specialists are among the program's best ambassadors.

The 'Soft Sell' Works Best

To help others use Tree City USA to promote community forestry in more towns and cities, several veteran foresters were asked to share their insights on what approach has worked best. The foresters, Jim Nighswonger in Kansas and David Mooter and Tom Schmidt in Nebraska, have been very successful in promoting community forestry in their states. They often use Tree City USA as the "hook" or the "carrot," as they say. But they also call their approach the "soft sell," which means the real key to success is working their program ideas into the community's rather than inflexibly trying to impose the same program in all places.

Here are ten suggestions based on the success of these community forestry coordinators:

- 1. Begin with solid staffing at the state level.** Be sure the hiring process screens for professionals who are technically competent and enjoy working with lay citizens in an education and support role. Communication skills - including the ability to listen - and plenty of patience are essential.
- 2. Let all communities know you are there to help and give them an idea of what services can be provided.** Then, respond to requests and prioritize your efforts based on the degree of interest expressed by the various communities.
- 3. Early in the process, identify potential local partners.** There is usually a group, maybe several, that can be brought into the initial meetings. At the same time, identify the one or two individuals who are the "doers" - the natural leaders. They need not be knowledgeable about trees, but they do need enthusiasm and lasting commitment. Without at least one such person, a community forestry program can not exist.
- 4. Win city council support.** When there is interest in the community, go before the city council to win its support and have a tree board officially established,
- 5. As a matter of routine practice, make sure that city staff are involved in all decisions.** Park, utility, street, budget and attorney's office personnel can be the key, to long-term success or an impassible barrier.
- 6. Begin with simple projects that are sure to succeed.** A few park plantings or beautification around an entrance sign will do more to launch a lasting program than a

grandiose plan or exhausting project. Follow up with other "bite size" projects.

7. Develop a plan, but fit the plan to the community. A plan hammered out in a local cafe and written on a paper napkin may be more effective than an inch-thick document. However, in most cases, a street and park tree inventory is the way to begin, using it to then develop a five-year or longer action plan. *TreeKeeper jr.* provides an excellent aid.

8. Use award recognition to build awareness and support. The appropriate time to introduce potential Tree City USA recognition will vary with the circumstances, but usually this is done best at one of the initial meetings. When the interest is there, assist in preparation of the application and support materials. Use the award as a way to publicly recognize accomplishments to date and all who have helped.

9. Know when to let go. In a successful program, the local board will want to make the decisions. The state community forester's job is to provide enough education to assure that good decisions will be made, and to be available with technical advice as needed.

10. Keep in touch. Through newsletters, invitations to workshops and occasional personal visits, keep each new program moving forward. The Tree City USA, Growth Award can be useful for suggesting new projects that help make a good community forestry program even better.

Through the cooperative efforts of all who make these programs work, it is indeed possible to improve America's urban and community forests. Instead of more trees succumbing to disease or other sources of destruction than are being planted, we can work toward replacement and filling the empty planting sites. We can work toward diversity of both species and age classes, and toward matching the right tree to each site. Hazards can be reduced and energy-conscious placement can be encouraged. In short, working together with the full support of municipal government-we can transform neglected or deteriorating situations into managed community forests that are healthy, safe and a source of pride. These are the goals of Tree City USA.

***TreeKeeper jr.* can assist with street and park tree inventories**

Recognizing that an inventory is a necessary first step toward the sound management of the tree resource, a low-cost, high-ability inventory software program has been developed to help small communities. Called *TreeKeeper jr.*, this high quality program operates on any IBM compatible PC. It can be used with very little training to add, edit, and delete trees recorded by building addresses or by city block; store a full range of information about each tree; compute tree values; keep records of care that each tree needs or has received; and print useful listings and summary reports on virtually any feature the user wants to input and track. Free technical support is available for 90 days and additional support after that on the basis of an hourly fee. The software is accompanied by a "plain English" manual to serve as a guide to laymen or professionals.

TreeKeeper jr. has a limit of 5,000 trees; the \$200 program is available to Tree City USA communities for only \$99.

To order, contact The Arbor Day Institute, P.O. Box 81415, Lincoln, NE 68501-1415 or phone (402) 474-5655.

Other Sources of Information

A Basic Library

A basic library to help anyone grasp the extent of urban and community forestry, its opportunities and how to meet its challenges, will include these four publications:

- *The Simple Act of Planting A Tree*
by Andy and Katie Lipkis
(Jeremy P. Tarcher, Inc., Los Angeles, CA)
- *Urban Forestry*
by Gene W. Grey and Frederick J. Deneke
(John Wiley & Sons, New York, NY)
- *Urban Forestry - Planning and Managing Urban Greenspaces*
by Robert W. Miller
(Prentice-Hall, Inc., Englewood Cliffs, NJ)
- *A Guide to Starting and Developing Community Forestry Programs*
by Craig Foss, Corinne Rowe, James Fazio and Ronald Mahoney
(University of Idaho Cooperative Extension Bulletin No. 692, College of Agriculture, Moscow, ID)

From The National Arbor Day Foundation...

- *Arbor Day Catalog*

A free, illustrated listing of items from balloons to sweatshirts available to support and help publicize Arbor Day and the Tree City USA program.

- *Celebrate Arbor Day!*

A 23-page booklet on how to celebrate the tree planting day. It includes a history of Arbor Day, poems, a play, ideas for a ceremony and more. Single copy, free; bundles of 50, \$17.95 ppd.

- *Trees Are Terrific! Curriculum Kit*

An outstanding curriculum kit for fifth grade that includes two instructional units: "Arbor Day-A Celebration of Stewardship" and "Be a Tree Sleuth." Includes a Celebrate Arbor Day! booklet. \$20.50 ppd.

- *Education Materials for Schools, Organizations and Communities*

A free list and order form for all publications available from The National Arbor Day Foundation, including bulk rates for distribution at meetings or special events.

- *Tree City USA Applications for*
 - Tree City USA Certification*
 - Tree City USA Recertification*
 - Tree City USA Growth Award*Copies are free of charge.

- *Keep A Great Thing Growing America - Tree City USA*

A 24-page, illustrated booklet that serves as an excellent introduction to the values of trees, the idea of community forestry, and the Tree City USA program. Free for distribution to community leaders.

Videotape

- *A Special Kind of Care*

This appealing, 13-minute video explains the concept of community forestry, its benefits, and what individuals can do to promote it in their hometown. The video describes Tree City USA and is a good choice for viewing by any group planning to start a forestry program. *Keep A Great Thing Growing America* is an excellent handout at any program where this video is used. Available from The National Arbor Day Foundation in VHF 1/2" format for \$15.90 ppd.

Training in Urban Forestry

In 1992, The Arbor Day Institute created the National Urban Forestry School to offer effective background education for professionals and lay leaders finding themselves in urban and community forestry but without formal training in that field. The School consists of three one-week sessions spread over either two or three years and becoming progressively more in-depth. Dates are spread throughout the year so that individuals can begin virtually anytime. Locations of Session I vary, also, to accommodate residents

in all parts of the country, with Sessions II and III being offered in centrally-located Nebraska City, Nebraska (near Omaha).

- **Session I:** The basics of arboriculture and urban forestry.
- **Session II:** In-depth treatment of topics considered by experts to be most deficient among urban and community foresters.
- **Session III:** A 'summit' seminar with some of the nation's most experienced and successful urban foresters and related professionals.

For a complete program description, phone 402/474-5655 or write to The National Arbor Day Foundation.



Acknowledgments...

This bulletin was produced in cooperation with Thomas Schmidt of the Public Land Management Program; David Mooter, Community Forestry Program Leader; and Kris Irwin, Assistant Community Forester; Nebraska Forest Service.

Tree City USA is a cooperative program of The National Arbor Day Foundation, National Association of State Foresters and the USDA Forest Service.

To order additional Bulletin copies... Friends of Tree City USA members may obtain a single copy of this or any of the 21 preceding *Tree City USA Bulletins* free of cost. Quantities of any issue are available at 25 for \$6.25 or 500 for \$100. To order: specify the issue number and quantity, and make your check payable to "National Arbor Day Foundation," 100 Arbor Ave., Nebraska City, NE 68410.

To join the Friends of Tree City USA... To receive a subscription to the *Tree City USA Bulletin*, and to become more involved in the

community forestry movement in your town and throughout America, send a \$10 dues-donation to Friends of Tree City USA, National Arbor Day Foundation, 100 Arbor Ave., Nebraska City, NE 68410. Make your check payable to "National Arbor Day Foundation."

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Return to: [Chapter 5 - Regreening the Community](#)

Chapter 5

Appendix C

Bulletin No. **18**
James R. Fazio, Editor



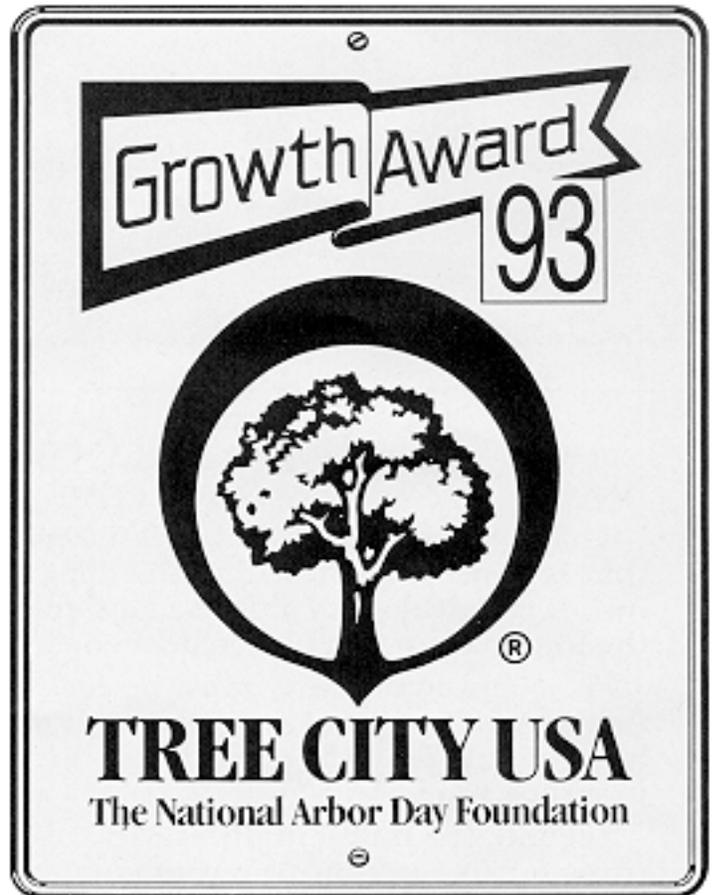
Tree City USA Growth Award

Since 1976, Tree City USA has served as a catalyst for community tree care. By providing management guidelines, high visibility and public recognition, Tree City USA has helped communities nationwide take the right steps toward stewardship of their tree resources. But today there is an urgent need for even more action on behalf of urban trees and for a more sophisticated level of tree care. The Tree City USA Growth Award program provides the next steps by recognizing communities where tree care programs have significantly improved, and by encouraging growth and development in others.

"Effective tree care is an ongoing process of growth and renewal - a program of planting and care that

continues through the years. Tree City USA provides a solid foundation for that process. But community leaders realize there is also a need today to do more and to do it better." So said John Rosenow, executive director of The National Arbor Day Foundation, when he announced the new Tree City USA Growth Award early in 1991.

The Foundation, in cooperation with the National Association of State Foresters and the USDA Forest Service, created the award program to recognize environmental improvement and higher levels of tree care throughout America. Importantly, the award is designed to do more than recognize achievement beyond the four basic standards of Tree City USA. It is also intended to communicate new ideas by showing community leaders what can and should be done in a well-rounded community forestry program. In short, the criteria for winning a Tree City USA Growth Award are an excellent checklist for planning the future of any community's forestry program.



Award winning communities receive an attractive highway sign to post at the entrance to their community.

For that reason, we depart from the usual format of the *Bulletin* to present you with the entire Growth Award application packet, including the list of criteria.

You are invited to join other Friends of Tree City USA in developing the kind of expanded community forestry program that will make your town or city a winner. In fact, because the competition is only against your community's own previous record, there is no reason why a Growth Award should not become an annual goal for your municipal forestry department or tree board.

The Roots of Tree City USA

Tree City USA was created in 1976 as a joint Bicentennial project of The National Arbor Day Foundation, USDA Forest Service and the National

Association of State Foresters. The partnership was soon joined and strengthened by the National League of Cities and the U.S. Conference of Mayors.

The new program helped expand the entire concept of Arbor Day from tree planting to total tree care. It also expanded the mission of The National Arbor Day Foundation which had been created during the centennial of Arbor Day in 1972 to breathe new life into the tree-planting holiday and bring its meaning more in line with the environmental needs of today's society.

Shortly after Tree City USA was created, forestry experts Gene Grey and Fred Deneke published the first edition of their book, *Urban Forestry*. In describing the Tree City USA program, the authors wrote, "Its impact as an incentive for development of local city forestry programs is yet to be determined." By 1986, when the second edition appeared, the authors were able to report, "Its impact... has been significant."

And so it has. Thanks to financial help from the USDA Forest Service, the federal Cooperative Forestry Assistance Act, and members of The National Arbor Day Foundation, the program has become the symbol of good community forestry nationwide. From 42 communities that joined during the first year, the network of members has now expanded to over 1,800.

With the added benefits of the Growth Award, it is hoped that more communities of all sizes will join the network and that all will, indeed, continually improve their programs on behalf of trees.



The benefits of improved community tree care touch the lives of all citizens and are a source of pride to the volunteers who make them possible. To share that pride, award-winning communities receive the attractive highway sign (previously illustrated), a framed certificate of achievement with accomplishments listed, media publicity, and national recognition.

Using the Growth Award Application

When you read the application form that is enclosed, you will notice that two initial requirements must be met before the application can be considered.

First, the community must be recertifying as a Tree City USA. That is, it must have been a Tree City USA for at least the previous year.

Second, the municipality's expenditures for its forestry program must be no less

than those of the year before. This is because communities that see tree care as a place to cut budgets clearly do not demonstrate the kind of commitment to improving environmental quality that is at the heart of the Growth Award program.

If the application form is missing from this copy of the *Bulletin*, please phone member services at (402) 474-5655 for immediate replacement.

TREE CITY USA GROWTH AWARD APPLICATION



Take Pride In Your Progress

- Make your community greener and more beautiful
- Clear the air, conserve soil and water, save energy, clean rivers and streams, and make a home for wildlife with more and better-cared-for trees
- Increase the value of the homes in your community, the economic vitality of your businesses
- Receive national recognition for improving the management of your town's trees

Tree City USA is a community improvement project sponsored by The National Arbor Day Foundation in cooperation with the National Association of State Foresters, USDA Forest Service, U. S. Conference of Mayors and National League of Cities.



Quality urban and community forestry programs are continually growing and improving. Tree City USA Growth Award recognition will be a powerful public demonstration that positive action is being taken to make your town a better place in which to live.

The Tree City USA Growth Award is provided by The National Arbor Day Foundation, in cooperation with the National Association of State Foresters and the USDA Forest Service, to recognize environmental improvement and encourage higher levels of tree care throughout America. This award is designed not only to recognize achievement, but also to communicate new ideas and help the leaders of all Tree City USA's plan for improving community tree care.

ELIGIBILITY: Your community may be eligible for the Tree City USA Growth Award if it is a Tree City USA for at least the second consecutive year and has spent at least as much on its community forestry program this year as it did last year.

If your community qualifies, you will receive Tree City USA Growth Award signs to place at community entrances, a certificate of achievement that enumerates your community's award-winning achievements, and appropriate local and national recognition.

In subsequent qualifying years the community receives a certificate of achievement and additions to the award signs denoting the year.

APPLICATION PROCEDURES: Review the Eligible Activities listed under Categories A, B, C, and

D in this booklet. If your community has completed activities during the year which total 10 or more points, you may apply for a Growth Award. Note: Your program may already have accomplished many of these activities; however, **only those completed in the past year are eligible.**

Complete the application form and mail to your state forester with the appropriate documentation attached to the form with a single staple in the upper left-hand corner. Include a cover sheet for the documentation for each Eligible Activity indicating the activity name and number.

The completed application with required documentation must be submitted to your state forester by December 31. Your Growth Award application must be sent to your state forester with your Tree City USA Application for Recertification.

Your community is eligible to apply for this award each year it completes Eligible Activities totalling 10 or more points.



**CATEGORY A:
EDUCATION AND
PUBLIC RELATIONS**

Eligible Activities

A1. Publications (2 points)

Materials for the public about tree planting and care, such as a listing of recommended street trees, were first published or significantly improved. (Please enclose a copy of the publication as documentation.)

A2. Literature Distribution (2 points)

A new method of public literature distribution (with utility bills, at garden centers, at public events, etc.) was developed and implemented successfully.

A3. Interpretive Program (3 points)

An interpretive program such as a walking tour of outstanding trees for community planting, an arboretum, a heritage tree program (largest, historic, etc.) or similar project was first made available to the public or was significantly improved.

A4. Local Awards Program (3 points)

A recognition program with awards to citizens, commercial enterprises, neighborhood associations, other citizen groups, etc. for such things as best landscaping, tree planting/care projects, etc. was initiated or significantly improved.

A5. Community-Wide Tree Event (4 points)

A special, community-wide tree event such as an Arborfest, Dogwood Festival, Oak Festival, etc. was initiated or significantly improved. (An Arbor Day celebration is a standard requirement to qualify for Tree City USA. Therefore, please report here only a community-wide, highly publicized Arbor Day celebration or festival in addition to Arbor Day.) Tree-related activities and/or exhibits must be part of the event. (Please include event name(s) and date(s) with documentation.)

A6. Publicity (5 points)

An ongoing publicity campaign for tree care and community forestry was initiated or significantly improved, for example a weekly newspaper column by the city forester or tree board, or a community-wide newsletter about trees.

A7. Youth Education (4 points)

A8. Continuing Education for Tree Workers (6 points)

A training/continuing education program for the city's tree workers, both employees and contractors, was initiated or significantly improved. The training must be provided at least annually - either by the city or by other qualified organizations. (Please indicate who provided training, the type of training and approximate percentage of tree workers who received 8 hours or more of formal training and percentage who received 40 hours or more of formal training.)

A9. Tree-Worker Safety Program (5 points)

A comprehensive safety program for city tree workers was initiated or significantly improved that goes beyond formal training to include such methods as daily warm-up exercises, wellness programs, safety newsletter, etc.

A10. Continuing Education for Forestry Managers and Tree Board Members (6 points)

A continuing education program for forestry managers and tree board members was initiated or significantly improved. Examples include participation in tree-related workshops, conferences, correspondence courses, or other structured educational programs for those involved with managing community forests. (Please include approximate percentage who attended conferences, workshops, or other such events, and approximate percentage who earned credit or continuing education units (CEUs), with documentation.)

A11. Tree-Care Workshops (4 points)

The city initiated or significantly improved a formal, community-wide tree-education program for youth (such as "Trees Are Terrific," "Grow Your Own Tree," "Project Learning Tree," etc.)

A workshop on some aspect of tree care was provided for the first time for homeowners, businesses and other members of the public. Or ongoing workshops were significantly improved or the public participation was significantly increased. (Please include date(s) and number attending with documentation.)

A12. Arborist Workshops (5 points)

Tree-care workshops were provided for the first time for private commercial arborists. Or ongoing workshops were significantly improved or participation was significantly increased. (Please include date(s) and number attending with documentation.)

A13. Publicity Event (3 points)

An activity specifically designed to gain publicity for the community forestry program was initiated or significantly improved.

"Needless to say, we are proud of our designation as a Tree City USA and we assure you that we will continue to take seriously our tree-care responsibility."

Jerry L. Gwaltney, City Manager
Waynesboro, Virginia



CATEGORY B:

PARTNERSHIPS

Eligible Activities

B1. New Project or Organization (4 points)

A new, significant tree project was accomplished by the city in partnership with a civic organization, youth group, or other corporate or volunteer entity. Or assistance was given in creating a new volunteer organization that contributes to the community forestry program.

B2. Utility Partnership (5 points)

A cooperative program between the city and a utility resulting in additional tree planting, planting appropriate species, improved pruning and other tree care, etc. was initiated or significantly improved.

B3. Green Industry Partnership (5 points)

A cooperative project between the city and businesses such as private nurseries or tree services resulting in improved planting stock, better tree care, improved landscaping methods, the recycling of wood materials, etc. was initiated or significantly improved.

B4. Cooperative Purchasing/Contracting (6 points)

A program was initiated or significantly improved for the community to cooperatively work with another community. (For example, to share a forester, to jointly contract for tree-care, computer or other professional services, to purchase expensive equipment such as a tree spade, or to pool tree orders.)

B5. External Funding (6 points)

The city applied for and received significant, nongovernmental funding (corporations, foundations, civic organizations, individual contributions, etc.) for community forestry. (Please indicate amount, source and use of funds with documentation.)

B6. Tree Planting on Private Property (4 points)

The city initiated or significantly improved a cost-sharing or other incentive program, an unusual publicity campaign, etc. to bring about more tree planting on private property. There should be attention given to planting the right tree in the right place, and encouraging long-term care.

B7. Engineering/Forestry Coordination (6 points)

Formalized coordination with city engineering was initiated or significantly improved to insure proper urban forestry review of street and utility plans, sidewalk construction, and similar

practices that impact the health of the city's trees.

**B8. Land-Use Planning
Coordination (5 points)**

Procedures for including tree professionals in land use planning decisions were put into place or significantly improved. Examples might include the appointment of a planning and zoning official to the tree board or vice versa, or routing all development site plans and applications through the city forester for input and approval.

"Waukesha has been a Tree City USA for eleven consecutive years. On May 10, Waukesha experienced a devastatingly spectacular freak snow storm. This nine inch, wet, heavy snowfall accompanied by high winds, occurred just after full leafout. Sixty percent of 30, 000 street trees sustained damage and 1, 000 required removal. To accomplish this enormous restoration task we approached the City's finance committee for emergency funds. After our presentation to the committee, the initial and immediate response of the chairperson was, 'We are a Tree City USA, we are proud of that designation and we intend to keep it.' The vote was unanimous in favor of all our requests."

"My point here (and I can not emphasize this enough) is that our designation as a Tree City USA was a tremendous positive influence in securing the support for necessary repairs and the continuation of Waukesha's Urban Forestry programs."

"I will close by simply saying, if you are not a Tree City USA now, become one; if you are already, sustain the title. The benefits to be accrued are manifold - take my word for it!"

David P. Liska, City Forester
Waukesha, Wisconsin



CATEGORY C:

PLANNING AND MANAGEMENT

Eligible Activities

C1. Tree-Maintenance Budget (9 points)

A budget line in the city budget specifically for tree maintenance (as opposed to planting or removals) was initiated or significantly increased. (Please indicate budget allocation for the current and previous year with documentation.)

C2. Municipal Funding (8 points)

Expanded or innovative municipal funding was developed to be used specifically to increase the planting and care of community trees. Examples include special tax districts, curb tax, bond issues, license fees, gas tax, utility surcharge, etc.

C3. Sidewalk/Curb Policy (5 points)

Policies were adopted or significantly improved which call for placement, construction, replacement and repair of sidewalks and curbs in a manner that will minimize tree damage. (Please enclose a copy of the policies as documentation.)

C4. Tree Inventory and Analysis (7 points)

A basic inventory of street and/or park trees was conducted for the first time or updated, and an analysis was performed indicating what conclusions are to be drawn from the inventory: species mix, planting and care needs, etc. (Please enclose copy of the inventory, or a

C8. Improved Ordinance (6 points)

A new or revised and significantly improved ordinance related to trees was adopted. The ordinance(s) must lead to the improved management and/or protection of trees and tree habitat and might include such measures as protecting historic or specimen trees, protecting trees and tree habitat during construction, conserving woodlands, ending tree topping, requiring new developments to preserve green spaces or plant trees, etc. (Please enclose copy of ordinance as documentation.)

C9. Standards and Specifications (6 points)

A standards and specifications document was adopted, or updated and significantly improved, as a separate document which complements the community's tree ordinance. Provisions might include such things as acceptable street trees to plant, standards for planting in downtown areas and along residential streets, and tree-maintenance guidelines. The standards would be updated and kept current by the city

sample from one neighborhood, and the analysis as documentation.)

C5. Computerized Tree-Management System (9 points)

The tree management system was first computerized and is site specific, i.e. individual trees identified with specific locations, and includes a work-reporting method with the work data on individual trees updated on a regular basis, preferably at least weekly.

C6. Management Plan (7 points)

A long-range, community-wide tree planting and management master plan using inventory data and covering at least the next 3-5 year period was first adopted or significantly improved. (Please enclose copy of plan as documentation.)

C7. Licensing (5 points)

A licensing program was initiated or significantly improved for all tree-care companies or individuals operating in the community. (Please enclose explanatory literature as documentation.)

forester, tree board, or equivalent authority. (Please enclose copy with documentation.)

C10. Wildlife Habitat (3 points)

Wildlife habitat was developed or protected, including such practices as setting aside "no mowing" zones, planting trees and shrubs for wildlife purposes, protecting riparian zones, adding water impoundments for wildlife, providing nest boxes, etc.

C 11. Park, Open Space (5 points)

Forested open space was acquired or a park developed with major tree planting. To use this criterion, it is necessary to demonstrate that the forestry staff or tree board was instrumental in the project. The land in question must be available for public use. Land covered by a scenic or other easement may also be included here.

C12. Disaster Plan (4 points)

A tree-care disaster plan was developed or significantly improved. The plan could outline who will provide what services after a severe storm, mutual aid available between communities or jurisdictions, and how to work effectively with the news media.

C13. Professional Tree Manager (10 points)

A full-time city forester or equivalent was hired for the first time. (Please indicate name, title, education/degree and starting date.)

"The Tree City USA program is extremely important to the people of Robbinsdale and will continue to be a goal for our urban forest management program."

Jonathan E. Stiegler, Formerly
Forestry and Environmental Services
Robbinsdale, Minnesota



CATEGORY D: TREE PLANTING AND MAINTENANCE

Eligible Activities

D1. Special Tree Planting Project (4 points)

A tree-planting project requiring special circumstances such as pit construction or vandalism protection was successfully implemented. Such a project would require a special appropriation, or special cooperation with the neighborhood or business district.

D2. Public Utility Tree Care (5 points)

The maintenance of publicly owned utility lines was significantly improved to reduce adverse impacts on trees. An example would be training in the use of state-of-the-art techniques that avoid topping trees.

D3. Recycling (6 points)

A biomass recycling program was successfully implemented or significantly improved. This may include

D6. Hazard Tree Program (5 points)

A hazard tree assessment and action program was established or significantly improved, including employee training and a systematic method that includes periodic tree inspections and prompt follow-up when needed.

D7. Special Program to Eliminate Destructive Practices (6 points)

A program such as an educational or ordinance enforcement campaign to eliminate tree topping community-wide, or a training program that eliminates tree damage caused by employees misusing

street tree leaves, lawn wastes, tree removals, Christmas trees, etc.

D4. Street Tree Planting (7 points)

The city formally established or significantly improved its street-tree-planting program.

D5. Street Tree Pruning (8 points)

A formal pruning system was established or improved for the city's street trees. This criterion requires significant improvement through the initiation of regularly scheduled visits to all street trees depending on the requirements of the species, or the reduction of time between visits if needed.

herbicides, weed cutters, and lawnmowers was successfully implemented.

D8. Integrated Pest Management (5 points)

Systems and methods for insect and disease control that are environmentally sensitive were put into place or significantly improved.

D9. Plans for Donations (3 points)

Plans were developed or significantly improved for projects such as vest-pocket parks, arboretum improvements, memorial tree groves, woodland acquisitions, etc. to be available in case of unexpected cash donations or similar opportunities.

D10. Contract Growing (5 points)

A contract with a nursery was initiated or significantly improved to provide specific varieties or species of street and park trees for future years (to enable planning and to assure having the right trees for the right sites).

"We are delighted with our recognition as a Tree City USA, and hope to do justice to this accolade by our further efforts to plant trees."

Stephen R. Reed, Mayor
Harrisburg, Pennsylvania



TREE CITY USA

[Click here for a Tree City USA Growth Award Application](#) (PDF format)

The Growth Award and Community Forestry

The success of Tree City USA is attributed to at least four factors: (1) The unique partnership that combines the resources and abilities of the federal government, state foresters, local foresters, citizen leaders, and a non-profit foundation - focusing them on a common goal of improved community forestry; (2) towns of any size can participate equally; (3) a growing appreciation of how trees contribute to the environmental quality and economic vitality of our communities, and (4) the realization that a systematic, well-planned tree care program is a wise investment.

The Growth Award builds on all these features and offers an opportunity to show what can be done. This, of course, is essential in selling others on the development of an improved program. What is also necessary to gain broad support is to show how a particular practice will benefit the community.

Examples abound of the link between pro-active management and community benefits: a new piece of literature enlightens homeowners who then plant low-growing trees near power lines or trees less prone to ice storm damage; a street tree inventory leads to a systematic planting program that fills open spaces and helps cool the summer air; an arborist workshop teaches a skill that prevents a serious accident - and the list goes on.

One of the most quantified examples of the link to benefits is shown below. The table was developed for the City of Rockford, Illinois, by the urban forestry consulting firm of ACRT, Inc. It clearly illustrates in dollars and good sense how a change in just one or two practices results in added benefits and proves to be an excellent investment of public funds.



Effects of Street Tree Service Levels on Tree Values and Benefits

Service Level	Current Value	Service Level for Next Five Years	Cost of Maintenance for Next Five Years	Changes in Tree Population	Future Worth In Five Years	RETURN:	
						Future Worth Less Maint. Costs and Current Value	Other Comments
None	\$44,229,800	None	None	8% mortality 20% decline in condition rating 3% diam. increase	\$29,801,800	- \$14,428,000	Maximum liability, Impractical
Current	\$44,229,800	Requested work only	\$1,008,000	6.6% mortality 10% decline in condition rating 3% diam. increase	\$37,040,900	-\$8,196,900	Liability risk: High
Minimal	\$44,229,800	10-year cycle, removals and safety trims as needed	\$2,318,400	5.6% mortality No change in condition rating 4% diam. increase	\$49,447,000	\$2,898,800	Liability risk: Low

Optimal \$44,229,800 5-year cycle, plantings, removals and safety trims as recommended	\$3,733,900	Plant 120% removals 10% increase in condition rating 5% diam. increase 5% species rating increase	\$70,732,700 \$22,769,900	Liability risk: Lowest
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Other Sources of Information

Tree City USA Bulletin will inform readers about helpful, up-to-date publications that provide more depth, serve as good models, or are readily available for community distribution. The editor welcomes sample copies to consider for inclusion in revised editions of this and other *Bulletins*.

A Basic Library To Direct Growth

Growth and improvement of community forestry must rest on a foundation of knowledge. Here are five books recommended as an excellent core library for self-improvement. To order, contact the publisher or ask your local bookstore to do this for you.

- ***Arboriculture - Care of Trees, Shrubs and Vines in the Landscape*** by Richard W. Harris (Prentice-Hall, Inc., Englewood Cliffs, NJ)
- ***Modern Arboriculture - A Systems Approach to the Care of Trees and Their Associates*** by Alex L. Shigo, (Shigo and Trees, Associates, Durham, NH)
- ***The Simple Act of Planting A Tree*** by Andy and Katie Lipkis (Jeremy P. Tarcher, Inc., Los Angeles, CA)
- ***Urban Forestry*** by Gene W. Grey and Frederick J. Deneke (John Wiley & Sons, New York, NY)
- ***Urban Forestry - Planning and Managing Urban Greenspaces*** by Robert W. Miller (Prentice-Hall, Inc., Englewood Cliffs, NJ)

Training Opportunities

The Arbor Day Institute, the continuing education and training arm of The National Arbor Day Foundation, offers a wide range of workshops and conferences each year in all parts of the country, and even correspondence courses. Opportunities range from introductory programs for new employees or citizen leaders to The National Urban Forestry School for professionals. For a complete course schedule, write to the Foundation or phone 402/474-5655.



Support Materials for Your Program

The National Arbor Day Foundation has developed a number of publications and visual aids to assist with your public meetings and programs. For a free catalog, contact the Foundation and request *The Education Materials Brochure*. Back issues of *Tree City USA Bulletin* also provide an excellent source of literature and are inexpensively available in quantity.

To help publicize trees, ask for a free catalog of publicity and gift items available to help promote tree planting, tree care, and Tree City USA. Send your name and address to *Arbor Day Catalog*, The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410.

To order additional *Bulletin* copies... Friends of Tree City USA members may obtain a single copy of this or any of the preceding *Tree City USA Bulletins* free of cost. Quantities of any issue are available at 25 for \$6.25 or 500 for \$100. To order, specify the issue number and quantity, and make your check payable to The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410.

The *Bulletins* available are:

- No. 1 *How to Prune Young Shade Trees*
- No. 2 *When a Storm Strikes*
- No. 3 *Resolving Tree-Sidewalk Conflicts*
- No. 4 *The Right Tree for the Right Place*
- No. 5 *Living With Urban Soils*
- No. 6 *How to Hire an Arborist*
- No. 7 *How to Save Trees During Construction*
- No. 8 *Don't Top Trees!*
- No. 9 *How to Write a Municipal Tree Ordinance*
- No. 10 *Plant Trees for America!*

- No. 11 *How to Prevent Tree /Sign Conflicts*
- No. 12 *What City Foresters Do*
- No. 13 *Trees for Wildlife*
- No. 14 *How to Kill a Tree*
- No. 15 *How to Recognize - and Prevent - Hazard Trees*
- No. 16 *How to Recycle Shade Tree Materials*
- No. 17 *How to Landscape to Save Water*

To join the Friends of Tree City USA... to receive a subscription to *Tree City USA Bulletin*, and to become more involved in the urban forestry movement in your town and throughout America, send a \$10 dues-donation to Friends of Tree City USA, The National Arbor Day Foundation, 100 Arbor Avenue, Nebraska City, NE 68410. Make your check payable to The National Arbor Day Foundation.

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The Tree City USA program is sponsored by The National Arbor Day Foundation in cooperation with the U.S. Forest Service and National Association of State Foresters. To be named as a Tree City USA, a town or city must meet four standards:

Standard 1: A Tree Board or Department

Standard 2: A City Tree Ordinance

Standard 3: An Annual Community Forestry Program

Standard 4: An Arbor Day

Observance and Proclamation

Each winning community receives a Tree City USA flag, plaque, and community entrance signs. Towns and cities of every size can qualify. Tree City USA application forms are available from your state forester or The National Arbor Day Foundation.

Published for the Friends of Tree City USA by



The
National
Arbor Day
Foundation
100 Arbor Avenue
Nebraska City, NE 68410

Return to: [Chapter 5 - Regreening the Community](#)

Chapter 6

Approaches to Working with Disaster Relief Organizations

6.1 Chapter Summary

When the impact of a disaster is beyond what local authorities can manage, communities may need to seek assistance from the State or Federal Emergency Management Agencies (SEMA and FEMA, respectively). Impacted areas may be declared a State or Federal major disaster or emergency. The declaration process follows the pattern of local authorities contacting SEMAs, the SEMA contacting the Regional FEMA offices, and Regional FEMA offices contacting the National FEMA office, which ultimately will contact the President.

After an area has been declared a major disaster or emergency, all appropriate parties are notified the kinds of assistance available are identified, and the areas included in the declaration are established.

A number of multi-agency teams work together to assess the impact and needs of the disaster. One team consisting of Federal, State and local representatives, completes a Damage Survey Report (DSR). It is critical that the local arborist or forester is involved on this team so that the impact on the tree resource is identified. The Interagency Hazard Mitigation Team (IHMT) studies the disaster area and recommends hazard mitigation options to be implemented to reduce future disaster impacts.

For a community to receive any funding for tree care activities, it must demonstrate a commitment to the tree resource. This commitment may be shown by having a tree ordinance, a community forest management plan or inventory, a staff forester, or by having Tree City USA status. Funding that comes as a result of a declaration is sought for a variety of uses. To obtain funding for the tree

resource, it is important to be prepared.

6.2 Chapter Outline

- I. Introduction
- II. The Declaration Process
- III. Federal Disaster Declaration and Activities
- IV. FEMA Disaster Assistance Program
- V. Dealing with the FEMA for Public Assistance
- VI. Developing a Disaster Survey Report
- VII. Disaster Survey Report Example
- VIII. Hazard Mitigation
- IX. For More Information

6.3 Introduction

When a disaster occurs, the initial response and recovery activities are emphasized at the local level. Local police, fire and public works departments work cooperatively to get the situation under control. Under certain circumstances, additional help will be needed. Local authorities may contact their State Emergency Management Agency (SEMA) for this assistance. SEMA will then determine, either through an actual site visit or a phone call, whether the area needs to be declared a disaster. If the area needs to be declared a disaster, SEMA will go to the Governor for such a declaration. In some cases, the disaster situation may exceed the capabilities of state and local forces, and the Governor may request that the President declare a "major disaster" or an "emergency."

A "major disaster" is defined as "any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion in any part of the United States, which, in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of states, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby." (FEMA, 1990).

An "emergency" is defined as "any occasion or instance for which, in the determination of the President, federal assistance is needed to supplement state and local efforts and capabilities to save lives and to protect property and public

health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States." (FEMA, 1990).

6.4 The Declaration Process

The actual process of declaring an area to be a major disaster or an emergency involves a number of steps. A declaration request may be denied at the state or federal level, the usual reason being that there is not enough damage. Note: Denials can be appealed. The following is a listing of the steps involved after a disaster has occurred when an area seeks state or federal disaster assistance, or both (Personal *communication*, Powers and Ogan, 1992):

A. Event occurs.

B. Local response. Local authorities (city, county, police, fire, etc.) respond to the disaster with activities such as clearing debris, searching for victims, and immediate repairs. If local authorities can handle the disaster with their own resources, they will not seek further assistance (process ends here). If not,

C. Local authorities contact SEMA. (See Chapter 9, Section 9.7, "State Offices Responsible for Disaster Operations.") SEMA will respond in person or by phone and complete a preliminary damage assessment (PDA). A PDA usually occurs as soon as possible. (Note: If damage is so severe and obvious, a PDA may not be necessary and the area may be declared a disaster automatically. The damage left behind by Hurricane Andrew, of 1992, is an example of an area that was automatically declared.) If a state declaration is warranted, SEMA will go to the Governor with a request. The request may or may not be accepted by the Governor. If it is not accepted, the local area may appeal and submit another request. If the request is accepted, the Governor will declare the area a State disaster and the area will receive State relief. In certain cases, the damage may exceed what the State can do to assist, and the State will seek Federal assistance. If so,

D. SEMA authorities contact regional Federal Emergency Management Agency (FEMA) offices (see Chapter 9, Section 9.6, FEMA Offices). The SEMA inspectors will share their findings with the regional Federal Emergency Management Agency (FEMA) office, and that regional FEMA office will submit a

recommendation to the National FEMA office for a declaration. The National office may or may not support the recommendation. If they do not support the recommendation, the State may appeal. The appeal will usually indicate damage figures that support the fact that there is more damage than initially reported. If this appeal is again denied, the State can appeal directly to the President. If the National FEMA officials support the recommendation, they will then go to the President and recommend that the area be declared a major disaster or an emergency.

6.5 Federal Disaster Declaration and Activities

After the President declares an area to be a major disaster or an emergency, all appropriate involved parties are notified (governor(s), members of Congress and Federal departments or agencies). The kinds of assistance that will be made available and the counties or other political subdivisions that are eligible to receive assistance will then be identified.

A FEMA official will be appointed as the Federal Coordinating Officer (FCO) for the area. Based on initial PDA's and other information, the FCO will make an appraisal of the type of relief most urgently needed. The role of the FCO is to coordinate all Federal disaster assistance programs and to ensure that appropriate action is taken to help affected citizens and public officials receive the assistance to which they are entitled.

The FCO also receives assistance from other Federal agency disaster assistance specialists by forming an emergency support team(s). The FCO will also establish a temporary Disaster Field Office within the area that was affected to serve as a central location to coordinate the relief and recovery effort.

Additionally, after the area is declared a major disaster or an emergency, the Governor and the Regional FEMA Director will execute a FEMA-State Agreement. This Agreement identifies the manner in which Federal aid will be made available. it includes the following: the areas within the State that are eligible for assistance, the division of costs among Federal, State and local governments; the official period of duration to be recognized for the major disaster or emergency; and any other conditions of assistance.

6.6 FEMA Disaster Assistance Program

Under the authority of the Stafford Act (Public Law 100-707), FEMA provides public and individual assistance for recovery and reconstruction projects after a Presidentially declared disaster or emergency declaration. To receive this assistance, the state is required to prepare a State Hazard Mitigation Plan (Section 409). Types of assistance include (Florida Department of Community Affairs Division of Emergency Management, 1994):

1. Public Assistance (Section 409)

As part of the Public Assistance Program, funding for appropriate cost-effective hazard mitigation measures related to damaged public facilities is available to local government.

2. Individual and Family Grant Program (Section 411)

The individual and Family Grant (IFG) Program can be used by individuals to fund limited hazard mitigation activities. The IFG Program provides grants to states for making subgrants to individuals or families for serious and un-met disaster related needs. Although the amount awarded to a family is fairly limited, the funds may be used to take minimum measures required to protect homes against the immediate threat of damage or further damage.

3. Hazard Mitigation Assistance Program (Section 409)

The Hazard Mitigation Assistance Program provides funding assistance to states and local governments to reduce vulnerability from recurring or potentially severe hazards by supporting hazard mitigation planning activities. The focus of the program is on hazard mitigation plans or the updating of previous plans.

4. Hazard Mitigation Grant Program (Section 404)

FEMA provides financial support to implement cost-effective mitigation measures that are consistent with measures identified in the 409 Plan. The state is responsible for the management and administration of the programs.

Funding for the replacement of trees lost during a disaster may be funded under the Public Assistance Program of the Hazard Mitigation Grant Program. The Hazard Mitigation Grant Program usually requires match funds and is funded by a small percentage of total federal dollars allotted to the disaster: hence, the amount of funding available is very limited.

6.7 Dealing with the FEMA for Public Assistance

For the purpose of this mitigation document, the focus of this section will be on the assistance available for trees as a community resource. For information regarding other types of assistance, refer to the document entitled, "Disaster Assistance Programs: A Guide to Federal Aid in Disasters." (FEMA, 1990.)

In order for a community or eligible group to receive any type of assistance from FEMA, they must submit a Notice of Interest (NOI) within 30 days after the area is designated eligible for assistance. The NOI establishes that the community is in need and would like to receive assistance from FEMA. Estimates of reimbursable tree damage and the amount of funding allowed will be calculated through the Disaster Survey Report (DSR) process and unit costs set by FEMA.

FEMA's unit costs are set nationally and may need adjusting for the disaster area. With the South Florida's Hurricane Andrew Disaster the original amount of \$100.00 per replacement tree and planting was far too low to cover replanting of adequate trees. Dade County's Tree Ordinance, which communities in the county are required to base their ordinances on, requires that at least eight foot planting stock be used. This size requirement, along with the rocky soil of South Dade County, made planting costs much higher than normal. Utilizing proper documentation (past planting costs and proof of ordinance enforcement) the reimbursable amount for replacement trees was increased to \$200.00. Also, the ordinance required replacement of lost canopy; with large trees being replaced with two or three small trees. **Note: It is very important that local personnel be aware of items that FEMA will reimburse for and the amounts that are paid so that these types of adjustments can be made as soon as possible.** FEMA personnel are sometimes activated retirees and they may not be aware of recent changes, or may lack specific knowledge in tree-related information.

A team made up of a local, a state and a FEMA representative will work together to assess the impacted areas and develop a DSR. This assessment provides FEMA and SEMA with an **estimated** budget needed for the relief and recovery effort. Note: The choice of the local and state representatives on a DSR team is critical. It is that local person's responsibility to show effectively and efficiently where the damage exists and the extent and cost of the damage and to describe what plans have been developed to correct the problem. It is also important to have personnel that are informed of the type of damage that has occurred. When dealing with tree damage and replacements, the local personnel should be knowledgeable of trees. It also helps if the state representative is also knowledgeable of trees and tree damage and can offer an "unbiased" assessment of the tree damage. judgment calls may need to be made on the tree's survivability.

In certain situations, the city forester may be actively involved in storm response activities and may not have time to serve on the DSR team. In that situation, a community can demand that FEMA provide the assistance of a tree-assessment team made up of people who are tree experts or FEMA consultants on contract. For example, during the Rochester ice storm of 1992, the city forester was not involved in the DSR team. The DSR team consisted of a FEMA consultant, a USFS urban forester, a computer engineer from the Army Corps of Engineers, and a local highway construction supervisor who knew the roads in the damaged area (Ossenbruggen, 1993) These DSR's are reviewed and submitted by the state to the FEMA regional director for approval. If approved, the state will serve as the grantee for the program with complete program management and financial responsibilities.

NOTE: During the Hurricane Andrew incident in South Florida, the Florida Division of Forestry was able to place a liaison at FEMA's Public Assistance headquarters to assist the agency in developing policies concerning trees. This proved valuable in setting replacement values, decisions concerning remedial pruning, salvaging of damaged trees, and replacement species selection.

In considering the tree resource during a DSR assessment, it is vital for the public assistance person to recognize a community's commitment to tree management. If a community is not committed to tree management and is not perceived as being committed to managing its trees as a resource, inspectors may not allow tree costs to be covered. Indications of a community's commitment may include, but are not limited to, the existence of a community tree ordinance designation as a Tree City USA community, the existence of a management or maintenance plan for their resources, a completed tree inventory, the presence of a community forester or arborist, or documents showing previous tree replacement or maintenance because of other natural occurrences. Communities should note the following two key points:

- A community must show commitment to the tree resource through some form of a dedicated tree care program. If this is not the case and the community recognizes the need and importance of a tree management program, the community may be able to show a dedication to pursuing the effort and therefore receive assistance.
- A local community forester or arborist must be involved in the DSR. In doing so, the person will serve as the expert in describing the situation in terms of numbers of trees lost, removed, damaged, requiring proper pruning, and numbers of trees to be planted.

Often during a DSR with smaller communities, the focus is not on damage and loss to the tree resource. In fact, tree resource information may not be included in the initial DSR. These DSR's can be amended. Therefore, if commitment is shown for managing the tree resource and figures indicating tree loss and damage are generated, the DSR can be modified to include them. Once again, the bottom line to getting assistance for the tree resource is: **A community must show commitment to maintaining its tree resource.**

The type of assistance available to communities that show a commitment to managing their tree resource falls under the category of "Public Assistance" for "Emergency Work." Emergency work consists of work involving debris clearance, trees, buildings, bridges, and any emergency protective measures by police and fire officials. Generally, the cost-share for this work is 75/25. Federal assistance covers 75 percent; state assistance matches at 25 percent. Sometimes, the state match will be divided between the state and local governments on a 12.5/12.5 basis, in other cases, the state will cover the full 25 percent. Note: For Hurricane Andrew in 1992, Federal Assistance covered 100 percent of the costs.

6.8 Developing a Disaster Survey Report

occasionally, there may be special considerations to the disaster due to the location of the disaster. In the cases of Hurricane Hugo and Hurricane Andrew, the potential of wildfires and their threat to improvements was increased beyond the resources of local and state wildfire fighting agencies. State agencies submitted DSRs to FEMA requesting additional work force and equipment to meet the increased workload. In both cases, the DSRs were approved and temporary resources were provided. Note: "Temporary" resources are still being used in South Florida and the North Carolina because of the hurricanes. South Florida's urban forest resources were damaged to such an extent that the Florida Division of Forestry requested, and was granted, additional urban foresters to plan and supervise the replanting process. (See Chapter 8, "Notes on Hurricane Andrew.")

The following outline is provided to help in developing these types of DSRs. (The situation that the additional assistance is needed for is referred to as the "issue.")

ISSUE: PUBLIC ASSISTANCE FOR RECOVERY PROJECT

I. BACKGROUND: Summary of how the disaster event effected the resource that the additional assistance is needed.

II. WORK ELEMENT: Summary of actions that need to be taken to rectify

the situation.

A. LEAD AGENCIES: List of agencies that will be the major contributors to the recovery process.

B. FUNDING: List of funding sources for recovery actions including FEMA.

C. SCHEDULE: A brief statement stating the beginning and end of the requested project.

III. INTRODUCTION: A description of the benefits and condition of the resource before the disaster and how the disaster affected the resource.

IV. ORGANIZATION, OPERATION, AND FISCAL MANAGEMENT

A. ORGANIZATION AND STAFFING: A brief description of the agency's organizational structure and where the requested project and personnel fit into the organization.

B. POSITION DESCRIPTION OF REQUESTED PERSONNEL: A detailed description of the duties of the requested personnel. (it is important to cover all duties of the positions because this section is used by FEMA to review the effectiveness and progress of the personnel.)

C. PROJECT DURATION: Estimate of the length of recovery process that additional resources will be needed.

D. PRIORITIZATION OF PROJECT ACTIONS

1. IMMEDIATE ACTIONS (FIRST PRIORITY) List of the immediate actions that need to be taken at the beginning of the workplan.

2. INTERMEDIATE ACTIONS (SECOND PRIORITY)

3. LONG-TERM ACTIONS (THIRD PRIORITY)

E. BUDGET INFORMATION: A detailed budget showing all estimated costs for the duration of the project including equipment (purchased and leased), personnel costs, and contractual expenses.

1. PERSONNEL: Estimated salaries for all additional personnel for the duration of the project.

2. EXPENSE: Detailed estimate of the cost of purchased and leased equipment for the duration of the project.

3. CONTRACTUAL: Detailed estimate of contractual expenses.

4. TOTAL PROGRAM COST

Note: It is important to emphasize that the requested project is within the normal operation of the agency requesting assistance but the disaster has created a situation that the agency's existing resources can not handle.

6.9 Disaster Survey Report

The following is an example of an approved DSR submitted to FEMA, written by Gene Dempsey and James B. Harrell, Cooperative Forestry Assistance Supervisor, Florida Division of Forestry. Utilize this example as a model when writing Disaster Survey Reports:

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

DIVISION OF FORESTRY

HURRICANE ANDREW URBAN REFORESTATION ISSUE

ISSUE: PUBLIC ASSISTANCE FOR RE-ESTABLISHMENT OF URBAN AND COMMUNITY TREES

BACKGROUND: Hurricane Andrew severely damaged the urban tree resources on both public and private lands in Dade, Monroe and Broward Counties and parts of Collier County. In the direct path of the hurricane, the estimates of trees destroyed (uprooted or broken off) or severely damaged (requiring extensive corrective trimming of major limbs) range from 60 to 90 percent of the pre-hurricane tree canopy. The immediate removal of the downed tree debris, plus the subsequent removal of trees that later die due to the indirect causes of physiological stress and/or insect and disease infestations, will essentially eliminate the urban tree canopy and denude the heaviest hit area of trees. immediate action is needed to insure that trees are replanted in urban areas and that the urban forest that develops does not constitute a safety hazard to the general public.

WORK ELEMENT: A proactive campaign of technical assistance beyond the normal capabilities of the Division of Forestry is necessary to insure the replanting of appropriate tree species on both public and private lands. The magnitude of the reforestation effort in the devastated area will require additional manpower and equipment to supplement current Division of Forestry resources. Total program measures to restore the pre-hurricane tree canopy should include:

- Assist community leaders and private landowners with the selection of appropriate tree species, eliminating exotic pest tree species and those species prone to wind damage.
- Disseminate information dealing with proper planting and location techniques.
- Provide information and education materials on the identification of hazardous trees created by Hurricane Andrew.
- Assist community leaders with the development of plans for continuing tree care and maintenance programs.
- Educate the public on:
 - chainsaw safety
 - safety hazards when clearing debris
 - debris disposal
 - equitable vendor prices
 - selecting a qualified arborist or tree care professional
 - selecting quality nursery stock
 - benefits of urban trees and the advantages of a healthier and safer urban forest.
- Host tree care workshops for private citizens.
- Conduct a study to determine the effects of hurricane-force winds on common South Florida tree species.
- Promote and coordinate volunteer tree planting programs.

LEAD AGENCIES: Florida Department of Agriculture and Consumer Services (FDOACS) Division of Forestry, Florida Cooperative Extension Service, Florida Urban Forestry Council

FUNDING: FDOACS Division of Forestry; Florida Cooperative Extension Service; FEMA

SCHEDULE: Begin immediately and continue through September 30, 1994.

[Hurricane Andrew Urban Reforestation Plan](#) (Click to view)

6.10 Hazard Mitigation

Assistance may also come to the community in the form of hazard mitigation. An Interagency Hazard Mitigation Team (IHMT) made up of individuals from state

and federal agencies, including FEMA, SEMA, Soil Conservation Service, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, USDA Forest Service, Federal or State Highway Departments, Economic Development Administration, the National Weather Service, the State Department of Natural Resources, and the U.S. Geological Survey, as well as others, work together to identify and make recommendations for activities and ways to reduce damage in future disasters. Depending on the Hazard Mitigation Funding that is available, communities may receive funding for one or more of the IHMT's recommendations.

Types of recommendations by the IHMT regarding the tree resource may include one or more of the following (please note, the list below is not all-inclusive, nor listed, in order of importance):

- Education of local authorities, tree care workers, urban foresters, arborists, citizens, and volunteer groups about urban forest management and about the need to properly plant, prune and maintain trees.
- Identification of trees that need to be pruned to reduce potential limb failure in future storms.
- Maintenance practices that will improve the overall health and quality of the tree for future disasters.
- The development of community tree ordinances.
- The completion of an inventory of the tree resource and a management plan based on information from the inventory.
- Identification of options for wood waste utilization or methodologies for the least cost disposal.
- The development of a hazard mitigation plan that considers the tree resource.

Hazard Mitigation Funding is limited. The amount of funding is determined by taking ten percent of the amount of funding that was received for the area for use for permanent restorative work. Thus, if an area is to receive \$1 million for permanent restorative work as a result of a disaster, then only \$100,000 would be available for hazard mitigation activities. These activities are not limited to the tree resource and may involve housing on floodplains, bridge replacement or restructuring, highway reconstruction, etc. Therefore, it is important that the activities that are recommended are deemed to be very important and can be well justified.

6.11 For More Information

Federal Emergency Management Agency. 1990. *Disaster assistance programs: A*

guide to Federal aid in natural disasters. Federal Emergency Management Agency. Washington, D.C. 20472

Florida Department of Community Affairs Division of Emergency Management, 1994. *State of Florida Hazard Mitigation Plan (Draft)*

Matheny, N. P., and J. R. Clark. 1991. *A photographic guide to the evaluation of hazard trees in urban areas*. International Society of Arboriculture, Savoy, IL 61874.

Shigo, A. L. 1989. *Tree pruning, a worldwide photo guide*. Shigo and Trees, Associates. 4 Denbow Road, Durham, NH 03824-3105.

Contact the nearest State Emergency Management Agency or local Federal Emergency Management Agency regional office for additional information. (Refer to Chapter 9, Sections 9.6 and 9.7, for addresses and telephone numbers.)

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Chapter 6

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES DIVISION OF FORESTRY

HURRICANE ANDREW URBAN REFORESTATION PLAN

**SUBMITTED BY: FLORIDA DEPARTMENT OF
AGRICULTURE AND CONSUMER SERVICES,
DIVISION OF FORESTRY**

SEPTEMBER 16, 1992

**PREPARED IN RESPONSE TO
MAJOR DISASTER DECLARATION
FEMA - 955-DR-FL**

1.0 INTRODUCTION

The extensive damage to trees on public and private property which occurred in South Florida as a result of the landfall of Hurricane Andrew on August 24, 1992, has left the area virtually treeless with

remaining trees posing possible safety risks. Initial surveys by the University of Florida conducted in the hardest hit areas indicate that as much as 100 percent of the tree canopy was destroyed. In addition it is apparent that pre-hurricane species composition and planting practices in urban and suburban areas resulted in extensive and unnecessary tree losses and associated property damage.

Both aerial and ground examination of tree damage revealed that poorly-formed and poorly-maintained native trees and numerous exotic tree and palm species broke apart or were uprooted by the storm. This resulted in additional damage to structures, utilities, obstructed roadways and canals, and an increased the threat to human lives.

Before Hurricane Andrew, the urban forest in South Florida contributed to the public well-being by providing many economical and social benefits. Many areas used trees and palms to create a tropical atmosphere in support of the local tourism industry. In this warm sub-tropical climate, trees provided shade resulting in lower cooling bills for both commercial and residential buildings. Trees provided social continuity that defined and held together local communities. Glare reduction, area beautification, soil stabilization, "backyard" tropical fruit production and stress reduction were all benefits provided by South Florida's urban and community forest.

Without a proactive education campaign, many communities and individuals in South Florida may be reluctant to replant missing and destroyed trees or may unknowingly recreate an urban forest of the same pre-hurricane species composition and quality with the same inherent weaknesses. A well-planned and coordinated planting program will advert this situation and result in the creation of a safer and healthier urban forest.

It is essential that, without delay, a strategy be implemented to educate **public leaders and private individuals so that** restructuring and replanting of the urban forest can take place in an orderly and timely manner. Without additional resources the Division of Forestry will be unable to significantly contribute to the re-establishment of South Florida's urban forest.

2.0 ORGANIZATION, OPERATION, AND FISCAL

MANAGEMENT

2.1 ORGANIZATION AND STAFFING

The Division is a Line-Staff organization where line has the responsibility for carrying out all Division programs of protecting and managing Florida's tree resources. The staff function provides planning in program areas, develops policy and procedure and assists the line organization with technical expertise. The staff also provides control through program audits and field inspections.

2.2 ANDREW-URBAN REFORESTATION ORGANIZATION

The Urban Reforestation Information and Education Coordinator and the Urban Reforestation Technical Assistance Coordinator will report to the Everglades District Manager. The district organization will be responsible for the planning and supervision of day-to-day activities.

2.21 URBAN REFORESTATION INFORMATION AND EDUCATION COORDINATOR

The Urban Reforestation Information and Education (I&E) Coordinator will be responsible for administering the information and education program. The I&E program will include press releases, public service announcements, mailings to residents, distribution of reforestation material, school and civic programs, Arbor Day and volunteer tree planting programs, distribution of TV and radio spots and the solicitation of trees and funds for the reforestation effort. All I&E materials will be produced in both English and Spanish. Technical guidance will be provided by the Forest Management Bureau.

2.22 URBAN REFORESTATION TECHNICAL ASSISTANCE COORDINATOR

The Urban Reforestation Technical Assistance Coordinator will be responsible for administering the service component of the Urban Reforestation program. Technical assistance will consist of training for appropriate public personnel, workshops for private organizations and groups, planning assistance for community leaders, organization of community tree planting programs, recommendations of tree species selection, organization of promotion tree and seedling sales, and development of guidelines for selection of arborists and quality nursery stock. Technical guidance will be provided by the Forest Management Bureau.

2.23 URBAN REFORESTATION STAFF LOCATION

The Urban Reforestation staff will be located in south Dade County. Office space will need to be acquired to support the program.

2.3 PROJECT DURATION

FEMA funding will determine the length of the project. The Florida Division of Forestry will request funding to continue for a period two years since the tree damage associated with Hurricane Andrew is extensive. The projected ending date is September 30, 1994.

3.0 PRIORITIZATION OF PROJECT ACTIONS

3.1 IMMEDIATE ACTIONS (FIRST PRIORITY)

Educate the public -- local governments and private citizens have begun immediate action on public grounds and private residents to correct tree damage as a result on Hurricane Andrew. Information is needed on: 1) chainsaw safety, 2) safety hazards when clearing debris, 3) debris disposal, 4) selecting a qualified arborist and 5) equitable vendor prices. Newspaper releases and radio/TV spots will be developed for homeowners on pruning, straightening small uprooted trees and immediate tree care needs. oral presentations will be made to local service organizations, organized volunteer groups and civic associations concerning immediate tree needs and safety.

Consult with Community leaders -- leaders of communities in the heavily impacted areas will need immediate guidance in the development on an interim working plan to restore the urban forest. An interim plan will be used to avert further damage to the urban forest and set priorities for an orderly re-establishment of the urban forest.

Train Municipal Personnel -- municipal personnel dealing with tree removal, tree restoration and hazard tree identification will need to be trained to manage with the special situations created by Hurricane Andrew. Specific attention will be given to development of recommended list of replacement and problem trees.

3.2 INTERMEDIATE ACTIONS (SECOND PRIORITY)

Establish a Task Force of foresters, arborists, utility foresters, Cooperative Extension Service personnel and others (organized by the Division of Forestry) to plan replanting strategies. The Task Force will develop a plan for funding, task assignments, implementation plans, and involvement of local citizens and volunteer groups.

Work with the Florida Urban Forestry Council to seek supplemental funding sources through the American

Forests organization and other national non-profit conservation groups.

In conjunction with the University of Florida, complete a study to determine effects of Hurricane Andrew's varied wind conditions on 30 of the major South Florida tree species. The information gained from the survey will include a list of recommended trees as well as a list of those trees causing the greatest damage.

3.3 LONG-TERM ACTIONS (THIRD PRIORITY)

Host tree care workshops for municipal personnel and private citizens on the identification of hazardous trees and proper tree care and maintenance. This will involve a team approach utilizing tree care experts from both South Florida and the Southeastern region.

Develop and print a handbook and companion brochure for local governments and private citizens on proper tree planting techniques, tree species and planting site selection tree care and maintenance. Promote and coordinate municipal and volunteer tree planting programs utilizing desirable tree species and quality planting stock. The tree planting goal will be to establish (as a minimum) a canopy coverage on public lands equivalent to that prior to Hurricane Andrew. In addition tree planting by private homeowners will be emphasized through special promotional tree sales and give-aways.

**FLORIDA DEPARTMENT OF AGRICULTURE
AND CONSUMER SERVICES**

DIVISION OF FORESTRY

**HURRICANE ANDREW URBAN
REFORESTATION PLAN**

**FLORIDA DEPARTMENT OF AGRICULTURE
AND CONSUMER SERVICES**

DIVISION OF FORESTRY

BUDGET INFORMATION

The following budget information is presented in three budget categories:
personnel costs, expense and contractual.

PERSONNEL
COSTS*

<u>Title</u>	<u>FY93</u>	<u>FY94</u>
Urban Reforestation I&E Coordinator	\$ 2x,xxx	\$ 2x,xxx
Urban Reforestation Technical	\$ 2x,xxx	\$ 2x,xxx

Assistance
Coordinator

Secretarial/ Clerical	\$ 7,000	\$ 7,000
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(20 hrs/week at
\$7.00)

Total salaries/FY	\$ 5x,xxx	\$ 5x,xxx
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**Temporary positions do not include fringe benefits.*

EXPENSE

<u>Units Required</u>	<u>Equipment</u>	Cost (\$)	
		<u>FY93</u>	<u>FY94</u>
1	Office Space/ Utilities (rental)	12,000	12,000
2	Vehicles, utility type, 2x (lease)	7,200	7,200
	Vehicle, maintenance and repair	500	500
1	Computer system (lease)	2,000	2,000
	Office supplies	2,000	2,000
	Fuel (15,000 miles/ yr/vehicle)	2,500	2,500

2	Telephone/Long distance charges	1,000	1,000
	Uniforms	800	400
	Printing and Reproduction	5,000	5,000
	Postage	1,000	1,000
	Hand tools	500	500
	Camera, 35mm	600	-
	Film and developing	200	200
	Advertising	3,000	3,000
	Total expense	38,300	37,300

Total Program Cost

\$191,360

Return to: [Chapter 6 - Approaches to Working with Disaster Relief Organizations](#)

Chapter 7

Tornado ReLeaf - A Case Study

Written by:
Mary B. Bushnell
Illinois Department of Conservation

7.1 Chapter Summary

In planning the essential elements of an effort to educate and promote prompt restoration of both private and public urban forests damaged by a natural disaster, it is important to:

1. Identify the need.
2. Identify the agencies, private organizations and individuals who have jurisdiction, funding and motivation.
3. Choose the leaders for the project.
4. Develop a mechanism to provide assistance.
5. Identify those who need and want assistance.
6. Provide publicity for the project.
7. Develop a time frame for the project.
8. Identify supporting relationships in the project.
9. Identify nursery leaders.
10. Develop criteria for species selection and standards for each species.
11. Develop periphery organizational support.
12. Identify an organization to receive tax deductible contributions, dispense the funds, and complete the audit.
13. Develop a mechanism to disperse the funds.
14. Specify a closure date for the project.
15. Develop the mechanism of accountability for the project.

7.2 Chapter Outline

- I. Background
- II. Initial Response
- III. Getting Started
- IV. Educating the Public
- V. Raising Funds
- VI. Providing Assistance
- VII. For More Information

7.3 Background

On August 28, 1990, a tornado struck the Illinois counties of Will, Kane and Kendall. Twenty-nine people lost their lives and the area sustained more than \$200 million in property losses. Those dollars do not reflect the value of the 3,000 trees that were totally destroyed or damaged beyond recovery.

The emergency work of restoring utilities to the area required all available assistance to the investor-owned utility companies serving their customers. At that point in time, damaged trees were regarded as a liability to be chopped and burned in order to restore vital transportation routes, electricity, cable television and telephone services.

When the emergency needs of the communities had been resolved, people began to look at the ravaged area. The reality of what had happened to the vegetative cover was understood. This impact was at first thought to be a strictly visual one, until residents comprehended the enormity of the loss of energy savings, air filtering, noise abatement, water conservation, and habitat that trees bring to both urban and rural localities.

As a member of the regional emergency response team, District Forester Tom Gargrave of the Illinois Department of Conservation (IDOC) identified the following response. He recommended that the IDOC identify needs and provide immediate educational and technical assistance to local governments, businesses and private landowners in the tornado-stricken corridor.

Prompt reforestation was the first concern. It is obvious that the sooner trees are replaced, the sooner growth occurs. What is not so obvious is the psychological impact of a denuded landscape on not only those who live there, but on those who pass through or who work in the neighborhoods. There is an air of hopelessness for the future as residents go about the difficulty of replacing homes, possessions

and personal records. As they sort through the paperwork with their insurance carriers, they get the bad news that their trees are not covered in their homeowners policies.

7.4 Initial Response

The IDOC hosted a general meeting on November 8, 1990, for all affected units of local, state and federal governments; not-for-profit organizations; and, residents.

Federal agencies invited included the Department of Agriculture's Agriculture Stabilization and Conservation Service (ASCS) office managers in the three counties, the Army Corps of Engineers, the Fish and Wildlife Service, and the USDA Forest Service (USFS). These agencies offer technical assistance capabilities, jurisdiction, related activities, and grant programs that might be accessed.

Illinois departments or agencies included the Department of Transportation (IDOT), Emergency Services and Disaster Agency (ESDA), the Department of Agriculture, the Department of Energy and Natural Resources (ENR), and the University of Illinois Cooperative Extension Service (CES).

Units and offices of local government included county boards, county disaster relief agencies, forest preserve districts, soil and water conservation districts, township officials, mayors, public works committees, municipal foresters, and park districts.

Not-for-profits included Girl Scouts, Boy Scouts, Red Cross, Telephone Pioneers of America, Garden Clubs of Illinois, Rotary and other service organizations, The Morton Arboretum, OpenLands, 4-H Clubs, church organizations, and Parent Teacher Associations.

DOC officials said their goals in hosting the meeting were to identify needs and decide on a plan of action to meet those needs. It was immediately determined that while there are many existing agriculture-related forestry programs and programs to replace publicly owned trees, there was no program to assist the private landowner in the replacement of "landscape" trees.

7.5 Getting Started

Tornado Releaf (TR) was organized in response to the need to reforest on a fast-

track basis. TR was divided into two segments: the Public Lands (TR-PUB) portion was organized under the direction of Dr. John Andresen, University of Illinois, Department of Forestry; and the Private Lands (TR-PRI) portion was under the direction of Mary B. Bushnell, PLANT ILLINOIS Program Director and Assistant to the Director of the DOC.

In a brief and informal telephone survey of the states in the USFS Northeastern Area, it was determined that Illinois is not unique in its lack of legal authority to provide monetary assistance or plant material to private landowners for "landscape" trees.

Another survey of disaster relief agencies revealed that private emergency relief groups were overwhelmed by the numbers of individuals applying for assistance. They were also astonished by the amount of donations pouring into their organizations.

These agencies were searching for a way to coordinate financial assistance and other services in order to prevent duplication and fraud. They were relieved to know that TR would deal with the problems and opportunities of reestablishing the urban forest.

7.6 Educating the Public

Timing is a key element of a successful financial assistance program for reforestation of private lands. Launching a fund raising effort too soon may invite criticism that human needs for housing, utilities and social services are not as important to the organization as its own special interest.

Launching too late entails the risk that the public is tired of hearing about the disaster or believes that the rebuilding process is over. There is always the very real concern that subsequent events will receive a large amount of media attention that will refocus public concern and interest.

The first step was to educate the public on the importance of replanting the urban and rural forest. Area newspapers carried articles on the benefits of trees in the communities and for their residents. Arbor Day 1991 and Earth Day 20 did a great deal of education work for TR. Even the play on words in the name of the program was helped by Global ReLeaf and their news releases and educational material during Earth Day 20.

An Arbor Day event was held in a centrally located municipality in the torn ado-

affected area. Demonstration streets were planted with both TR-PUB and TR-PRI trees, and each tree had a red, white, or blue bow attached to catch the eye of the public. A parade was held complete with a high school marching band, banners, children, elected officials, and volunteers.

Three historic trees were planted to commemorate the event. These George Washington Sycamores were grown from seed collected from a Sycamore planted at Mount Vernon by General Washington. One was planted in a park to honor the victims of the tornado, one on public land to call attention to TR-PUB, and one on private property to focus on TR-PRI. The event was covered by a variety of local newspapers and TV stations and was filmed by the local cable television station.

7.7 Raising Funds

Early on, TR-PRI decided the organization must raise money for assistance through the private sector.

It is vital in a fund-raising program to decide how to go about the process. If professional fund-raisers are the choice, the sponsoring organization must do a thorough search using the best method possible. Cost, experience and reliability must be verified and the need for legal representation in writing the contract for services is essential.

If the sponsoring group decides to do the job itself, a number of considerations must be assessed. They are as follows:

- Is the project going to be run by a committee or an individual?
- Who are the potential donors?
- Is there a targeted audience?
- Is there to be an advertising campaign, and who is to develop the print and video materials for such a campaign?
- Who is responsible for the fund-raising material to be sent to potential donors?
- Can the group find a "name" or well-known person to endorse the project, who will lead the fund-raising campaign?
- Who has the ability and the reliability to handle the donations as they come in?
- How is accountability for the project going to be handled?
- Are the books to be audited at the completion of the project?
- Will the donations be tax-deductible?

Just as vital are the concerns about how, when and who qualifies for the funds after they are acquired. Donors will want to know how the funds are to be managed and how distribution will be made. Questions to consider include:

- Is the process fair and open?
- What is the criteria for financial aid and how can those qualifications be verified?
- When is distribution going to be made?
- Is there a definite date for the closing of the project?

TR-PRI, through the support of private organizations and the DOC, decided to do the fund-raising itself rather than hire a professional group. Fund-raising was done by PLANT ILLINOIS, with the program director and a volunteer as co-chairs.

The Illinois Forest Park Foundation volunteered to receive the donations and dispense the funds to the recipients. They also volunteered to pay for an independent audit report at the close of the project. The Forest Park Foundation is recognized by the Internal Revenue Service as a 501-C3 organization, so all donations were tax-deductible.

Governor Jim Edgar and DOC Director Brent Manning agreed to sponsor the TR-PRI fund-raising effort by sending a letter to potential donors.

The areas targeted to receive letters asking for donations were the counties of Kane, Kendall, Will, DuPage and part of Cook. Lists were prepared using Chamber of Commerce memberships and economic development lists of businesses in those counties. There was a deliberate decision to eliminate all those appearing on the lists with zip codes in the devastated area. Those businesses had either been directly or indirectly impacted by the tornado, and their resources were strained at best.

The letter was developed, approved, signed, and mailed to 1,500 business people. A financial institution volunteered to accept the donations for the Forest Park Foundation. Further fund-raising was targeted to foundations headquartered in Illinois or those with a direct link to the tornado area which had grant criteria applicable to the TR-PRI project. These foundations are supported by a corporation or business with facilities in Will, Kane, or Kendall counties. Grant applications were written and sent to three foundations.

7.8 Providing Assistance

As the decisions were being made on the fund-raising for TR-PRI, the co-chairs were also developing the criteria and the methodology on how to identify and verify recipients for the fund distribution. Using IDOT low-level aerial photographs of the affected area, both before and after the tornado, Peter Roberts, DOC photogramatist, and Lisa Burban, USFS Urban Forester, determined the exact path of this tornado. With the assistance of township assessors, they identified the parcels involved and the numbers of trees lost.

Each parcel index number, the owner's name, and the address were entered into a DOC computer. Letters were sent to owners outlining the details of the TR-PRI program. At the same time, public notice was given through area newspapers of the TR-PRI process. Those who thought they were able to meet the eligibility requirements, but who did not receive a letter, were told to call their township office to be added to the list.

The DOC District Forester contacted local nurseries asking if they wished to participate in the program. If so, they were asked to sign a statement agreeing to: 1) sell only trees recommended by the District Forester; 2) sell only those trees that would meet or exceed the forester's minimum standard for that species, and, 3) sell the tree at wholesale prices. Delivery and guarantee costs would be priced separately. Nine nurseries signed the agreement of participation.

The TR-PRI co-chairs next sent applications to the list of those property owners who qualified or assistance. They were asked to return the application by a specified date in order to receive a voucher that they could then use to purchase a tree from one of the nine participating nurseries.

The value of the voucher was determined by dividing the number of applications into the total amount of money raised. The TR-PRI said very specifically that the value of the voucher and the discount would not exceed 50% of the purchase price of the tree. TR-PRI felt from the beginning of the project that the property owner should have their own money in the cost of the tree to provide an incentive to proper care and maintenance of the tree. In the case of the TR-PRI project, \$16,000 was raised. The participating nurseries valued their wholesale price at approximately \$35.00 per tree. By dividing the number of applicants into sixteen thousand, we arrive at a voucher worth \$35.00. The value of the voucher, added to the discount of \$35.00, meant that trees were available for purchase at \$70 off the retail price.

Vouchers were sent to all who applied for assistance on April 1, 1992. Household members were asked to tie a red bow on their tree as they planted it. We wanted the public to identify with the trees planted under this program.

The vouchers were valid until October 15, 1992. Any funds left after that date were used for a lottery. Every applicant was eligible for a drawing to close out the program. Those lottery vouchers will be used for tree planting in the spring of 1993. A follow-up survey of those who applied will be conducted at the conclusion of the program. The TR-PRI believes it is important to measure the public reaction to the program. Questions to consider include:

- Was the timing correct?
- Was the procedure too difficult?
- Were potential applicants discouraged from taking part because of the criteria TR-PRI set into place?

7.9 For More Information

Miller, R.W. 1988. *Urban forestry: planning and management urban greenspaces*. Englewood Cliffs: Prentice Hall.

TreePeople. 1990. *The simple act of planting a tree*. Los Angeles: Jeremy P. Tarcher, Inc.

Trees, please! Pekin Illinois/Illinois Department of Conservation. Video, 15 minutes.

National Arbor Day Foundation
100 Arbor Avenue
Nebraska City, NE 68410
(420) 474-5655

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Chapter 8

Notes From Hurricane Andrew

**Written by:
Gene Dempsey, Florida Department of
Agriculture
and Consumer Services' Division of Forestry**

8.1 Chapter Summary

Damage to the urban forest in Dade County, Florida by Hurricane Andrew was unparalleled to any natural occurring event in the United States' past history. In many areas, almost all of the trees were destroyed. Much of the hurricane related-damaged was a result of poorly located trees, poor species selection and improper maintenance. Efforts have been made and will continue to provide communities and volunteer groups with the most up-to-date technical information, so that replanting efforts can avoid past mistakes.

8.2 Chapter Outline

- I. Background
- II. Immediate Actions - Information Distribution
- III. Clean Up Efforts
- IV. Recovery Efforts
 - A. Planning
 - B. Public Education
 - C. Tree Planting
- V. For More Information

8.3 Background

At 5:05 A.M. EDT on August 24, 1992, Hurricane Andrew, with sustained winds of 145 mph, made landfall on South Florida's coast near Homestead Air Force Base. (See *photograph 7.*) In about four hours, the hurricane had traversed the southern tip of the Florida peninsula and entered the Gulf of Mexico. Less than two days later, Hurricane Andrew struck the Louisiana coast with sustained winds of 120 mph. Hurricane Andrew was the third strongest storm to make landfall in the United States this century. Also, Andrew was, at that time, the most costly natural disaster in United States' history in terms of property loss (approximately \$25 billion) (U. S. Doc, 1993).

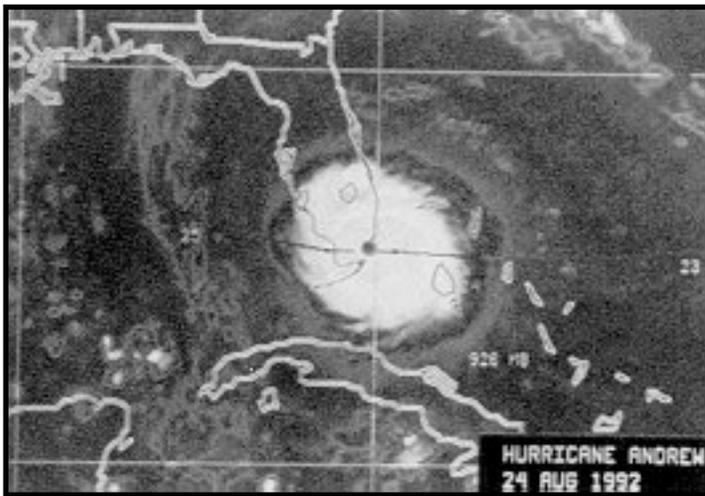


Photo 7. Satellite view of Hurricane over Florida.
(National Oceanic and Atmospheric Administration)



Photo 8. Hurricane Andrew Damage.
(National Oceanic and Atmospheric Administration)

The devastation caused by Hurricane Andrew over South Florida was immense. (See *Photograph 8.*) A total of 126,000 houses were destroyed or damaged, and 9,000 mobile homes were demolished. At least 160,000 people were left homeless in Dade County, and many were left without jobs either temporarily or permanently. (See *Photograph 9.*) Amazingly, the loss of human life, directly or indirectly resulting from Hurricane Andrew, was very low. In Florida there were 44 fatalities with only 17 in Louisiana.

Hurricane Andrew was an unusually compact storm when it hit the Florida coast. Hurricane-force winds were confined to a region approximately 70 miles in diameter. The most severe damage occurred along the swath of the eye and in the surrounding eyewall. In Florida the most severe damage was limited to a 30 mile wide area in South Dade County. Unlike other hurricanes affecting the United States, most of the damage caused by Hurricane Andrew was a result of the severe winds rather than the storm surge. (See *Photographs 9 & 10.*) Experts feel that Hurricane Andrew will likely prove the norm for future storms in that winds will pose a very significant threat to life and safety and will cause most of the property damage (US DOC,

1993).



*Photo 9. Impact of Hurricane-intensity winds-- plywood driven through a tree.
(National Oceanic and Atmospheric Administration)*



*Photo 10. Near total loss of canopy as a result of Hurricane Andrew.
(National Oceanic and Atmospheric Administration)*

The extensive tree damage on public and private property which occurred as a result of Hurricane Andrew left the area virtually treeless. (See *Photograph 10.*) Trees that remained posed possible safety risks. Initial surveys by the University of Florida conducted in the hardest hit areas indicate that as much as 100 percent of the tree canopy was destroyed. (See *Photograph 11.*)



*Photo 11. Trees literally shattered as a result of Hurricane Andrew.
(National Oceanic and Atmospheric Administration)*

Less severe tree damage extended as far north as Palm Beach County. **In addition, it became apparent that improper and inappropriate pre-hurricane species composition, planting**

and maintenance practices in urban and suburban areas resulted in extensive and unnecessary tree losses and associated property damage. For example, aerial and ground examination of trees, damage revealed that poorly-formed and poorly-maintained native trees, numerous exotic trees and some palm species were shattered or were uprooted by the storm. This resulted in additional damage to structures, utilities, obstructed roadways and canals, and increased the threat to human lives. Hence, mitigation practices as outlined in Chapter 3, are highly recommended to reduce or eliminate these impacts.

Before Hurricane Andrew, the urban forest in South Florida contributed to the public well-being by providing many economical and social benefits. Many areas used trees and palms to create a tropical atmosphere in support of the local tourism industry. In this warm subtropical climate trees, provided shade which resulted in lower cooling bills for both commercial and residential buildings. Trees provided social continuity that defined and held together local communities. Glare reduction, area beautification, soil stabilization, "backyard" tropical fruit production, and stress reduction were all benefits provided by South Florida's urban and community forest.

Without a proactive urban forestry education campaign, many communities and individuals in South Florida may have been reluctant to replant missing and destroyed trees or may unknowingly have recreated an urban forest of the same pre-hurricane species composition and quality -- with the same inherent weaknesses. A well planned and coordinated planting program was needed to help to prevent this situation and promote the creation of a safer and healthier urban forest. It was essential that a strategy be implemented to educate public leaders and private individuals so that planning, restructuring and replanting of the urban forest could take place in an orderly and timely manner.

At the time Hurricane Andrew struck South Florida, the Florida Department of Agriculture and Consumer Services' Division of Forestry (Division) had nine urban foresters assigned to this region who were able to offer assistance to communities and individuals. The Division was also able to respond by sending foresters and rangers from other parts of the state to assist. The Everglades District of the Division went from 40 full-time employees to as many as 200 immediately following the storm. As a result of being involved with recovery and replanting efforts, many things have come to light that might assist others involved in such a disaster.

8.4 Immediate Actions - Information Distribution

The immediate response of all involved agencies was the safety and well being of all individuals in the areas hardest hit by Hurricane Andrew. Initial actions included clearing roadways, establishing temporary housing, restoring lines of communication, supplying food, ice and drinking water, and meeting medical needs.

The Division realized that during the period immediately after the hurricane, agencies,

communities, and individuals were involved in many activities that involved trees. Most communities had plans to deal with all the aspects of disaster recovery -- except for the urban forest. The Division established an urban forestry liaison with the Federal Emergency Management Agency (FEMA) to aid FEMA and affected communities in tree-related issues. Refer to Chapter 6 of this document for more detailed information.

The Division worked with the Florida Urban Forestry Council (Council) to develop an information packet containing publications, references and contact telephone numbers for groups and communities involved with correcting tree damage. It was felt that accurate information about tree clean up, maintenance needs and post disaster management was critical immediately after the disaster. Information included:

- chainsaw safety
- safety hazards when clearing debris
- debris disposal
- basic tree pruning techniques
- arborist selection criteria
- equitable vendor prices

Previously printed material from national groups such as the National Arbor Day Foundation, American Forests, International Society of Arboriculture, and the National Arborist Association was used to speed up the production and distribution of the packet. A cover letter from the Chair of the Council provided information on finding replanting assistance.

Note: During the period immediately following Hurricane Andrew, all of the local television and radio stations were broadcasting recovery information 24 hours a day. There was abundant opportunity for tree experts to distribute advice through the mass media. I would recommend that local, state and federal agencies produce public service announcements (PSA's) covering the above information for use during such a period after a future disaster.

8.5 Clean Up Efforts

It is quite possible that more trees were damaged as a result of debris clean-up than were damaged directly by Hurricane Andrew. In the urgency of clearing roads, trees were "topped" that could have been pushed to the side and later uprighted. Trees that were left standing by the storm were "topped" to remove damaged branches or in fear they might blow over in future storms. Trunks of trees along roadways were damaged when the trees were used as brace posts to load debris. Natural and endangered areas were bulldozed to make room for tent cities to house the large number of storm-related homeless people. Most of these problems could have been avoided with proper planning. Some of the areas that need to be considered in planning for disaster recovery are listed below:

- **Areas need to be designated as temporary dumping sites for debris disposal.** The amount of debris produced by Hurricane Andrew was tremendous. Dumping and burning sites were set up throughout the area in suitable open tracts, but some locations proved troublesome due to traveling distances and close proximity to residential area.
- **When clearing roads, especially side roads, care should be given to indicate trees worth saving.** These trees then could be carefully removed from the roadway and uprighted later. Also, plans should be developed for trees of special significance to a community and champion or historic trees, so that special care could be given immediately after a disaster to save the tree if possible.
- **Trees that will be uprighted in the future should received immediate care.** The root systems of blown-over trees should be shielded from the sun as soon as possible and protected from drying out. Materials used for this purpose should allow the roots to gain oxygen. After Hurricane Andrew, many communities were interested in salvaging trees that had been blown over during the storm. Unfortunately, most communities were so involved in other recovery efforts that it was three to six weeks after the storm before these operations started. Many of the root systems of these trees had been exposed to sunlight and possibly disease; therefore, the trees probably won't survive.
- **Blown-over trees should be treated as transplanted trees.** Community tree crews and others involved need to be instructed on techniques of salvaging trees. Care needs to be taken when pruning the crowns and roots of blown-over trees so that the trees are not further damaged. It was common practice after the hurricane to "top" blown-over trees to reduce the weight when uprighting. Furthermore, almost no concern was given to root systems. Pruning of crowns should be minimal, and damaged roots should be pruned to remove rough tears and so that the remaining roots will "fit back in the hole." Once a tree has been properly uprighted it will need watering daily, just as if it were a transplanted tree.
- **People need to be instructed of proper care of storm-damaged trees.** Most communities in South Florida battle with unscrupulous tree trimmers on a daily basis. Unfortunately, after major disasters, many more "fly by night" tree services appear to work their magic on trees. Instead of applying proper techniques to do remedial pruning on damaged trees, many trees were "topped" so that the tree service could move on to the next house. Homeowners and even community leaders need to be continually instructed on proper tree pruning both before and after a disaster to prevent this from happening.
- **Tree debris should be separated (when appropriate) and utilized for mulch, firewood, and other landscape materials rather than disposed of with other storm damaged materials.** Volunteers could assist local crews in the separating out of woody materials.

8.6 Recovery Efforts

It was nine months after Hurricane Andrew had struck South Florida before any major

replanting efforts were started. During these nine months following the storm, most people involved were just trying to pick up the pieces of their lives and regain some normalcy. Fortunately, an effective replanting program was seen as a need; and, the Division, along with local and national experts, began the planning process.

Planning

The Division approached FEMA with the need of supplementing the urban forestry staff in the Dade area. Two temporary urban forester positions were approved, which resulted in an Urban Reforestation Information and Education Coordinator and an Urban Reforestation Technical Assistance Coordinator being placed in the south Dade County area. The job duties of these two positions included:

- developing press releases and Public Survey Announcements (PSAs)
- conducting mailings to residents and community leaders
- distributing reforestation information
- coordinating school and volunteer tree plantings
- conducting educational programs and workshops
- soliciting trees and funds for the reforestation efforts
- training community personnel in tree planting and care techniques
- providing planning assistance to communities
- developing specie recommendations for replanting projects

A Hurricane Reforestation Task Force was also formed that included foresters, arborists, utility foresters, Cooperative Extension Service personnel, and other appropriate persons. Local, state and national experts were involved in developing a plan for funding, implementing, and involving citizens and volunteer groups in the reforestation effort. The group developed the following goals for the replanting of South Florida (Hurricane Reforestation Task Force Goals, 1993):

1. **Environmental** - Replace and expand the tree canopy with a diverse, ecologically functional forest of high quality, energy-saving and properly maintained trees.
2. **Cooperation** - Gain cooperation between Federal, State, County, and Municipal agencies and departments with civic and environmental organizations to establish and maintain the urban forest.
3. **Education** - Conduct a public and private sector awareness and education campaign on environmental and economic benefits of replanting and restoring the tree canopy.
4. **Masterplan** - Design a "do-able" masterplan for re-establishment of the urban forest. The plan should develop standards for tree selection, planting and care, provide a "future storm" perspective, and be updated continually to incorporate latest technical advances.
5. **Funding** - Identify and obtain dedicated funding source(s) for planning, replacement and maintenance of existing and replanted trees plus all related costs (i.e. labor, equipment,

and materials).

6. **Procurement of Plant Materials** - Identify sources and make available needed materials on programs, assistance and contract growing options.

As a result of the task force meetings a request for \$1.66 million was submitted to Congress to supplement base funding from FEMA. After Federal approval, the Hurricane Andrew Urban Reforestation Grant Program was developed and provided much needed funds (100% Federal dollars, no local match required) to communities and civic and volunteer groups. Money was provided for:

- **Tree inventories** for assessment of tree planting needs and the evaluation of hazard trees.
- **Tree planting** on public school grounds and public parks and right-of-ways.
- **Educational program** development on the topics of tree care and maintenance.
- **Structural repair** and trimming of damaged trees in public parks and right-of-ways.

It soon became apparent that while there was funding for trees available to the public sector and nonprofit groups, there was no funding available for the private sector. **Homeowners had few, if any, options available to them for assistance in re-establishing their landscapes.** In an effort to assist the private sector, the Division worked with the National Tree Trust and local corporations to establish temporary nurseries that will "grow out" donated seedlings. The seedlings will then be donated to the public in a few years when they reach sufficient size.

Public Education

The Division, through funding provided by FEMA, has been able to develop several booklets, brochures and displays to aid in educating community leaders and the public on tree selection, tree planting, tree care and maintenance, and the proper reforestation of Dade County. Numerous workshops and symposiums have been held throughout the area to provide forums for discussion of reforestation efforts. Displays and information booths have been set up at county fairs, festivals and other public events to distribute information. Thousands of people have been reached through these events and efforts, and requests for these services continue to come in.

Tree Planting

The greening of the area devastated by Hurricane Andrew is a project which no single entity can accomplish. Cooperating efforts among citizens, public and private groups, are essential to greening success. While the funding provided by FEMA and the Hurricane Andrew Reforestation Grant Program has provided for tree planting, this will not replant the area back to what it was before the storm. Many groups have already been involved in the replanting of the urban forest in South Florida:

- The United Way's 1993 Annual Community Service Event was the rebuilding of a community park in Florida City. Hundreds of trees and shrubs were planted along with the new playground equipment and pavilions. Community leaders and the media were a part of the event which gave area attention to the regreening needs of South Dade.
- A project started a few months before Hurricane Andrew called "Leaves over Miami", funded by Texaco and American Forests' Global Releaf provided hundreds of trees after the storm to be planted on public school grounds. Division and School Board personnel worked together with Parent and Teacher Organizations (PTOs) and other volunteers to plant the trees to reduce costs.
- The Florida Federation of Garden Clubs collected nearly \$20 thousand dollars, which was matched with a Urban and Community Forestry Grant to plant trees in the South Dade area. The Division worked with the Garden Clubs to develop a program patterned after the "Leaves over Miami" project to plant trees on school campus' that were in separate need of vegetation.
- Trees are now being planted at intersections along a U.S. 1, a main artery of South Dade, by a volunteer group called South Dade Beautification. The group has received a Small Business Administration Tree Planting Grant for the plantings.
- Cool Communities, a energy conservation program through tree planting, has provided privately funded grants to many groups for tree planting.
- The Florida State Parks Division has started replanting a 400 acre park totally destroyed by Hurricane Andrew. Over \$4 million (federal dollars), in the form of state-administered grants, have been allotted to this re-establishing of a natural area and coastal park. Thousands of trees will be replanted during this project.

Note: Through the State-administered grant programs the Division has been able to provide some control over the quality of planting stock and the species selection. This is critical to the area due to the potential use of exotic and invasive tree species.

8.7 For More Information

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U.S. Department of Commerce, *Hurricane Andrew: South Florida and Louisiana August 23-26, 1992, Natural Disaster Survey Report*. National Oceanic and Atmospheric Administration and National Weather Service, Silver Spring, Maryland. November 1993.

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Chapter 9

Technical Resources and Information

9.1 Introduction

Many different resources have been identified for further information. The listings in Chapters 9 and 10 are not meant to be exhaustive. They serve as a beginning when looking for additional information.

9.2 Chapter Outline

- I. Technical References
 - A. Articles and Technical Papers
 - B. Books and Pamphlets
 - C. Journals and Magazines
 - D. Videos
- II. Organizations With Resources
- III. 50 State Forestry Offices
- IV. Federal Emergency Management Agency (FEMA) Offices
- V. State Offices Responsible for Disaster Operations

9.3 Technical References

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Merullo, V. D. and M. J. Valentine. 1992. *Arboriculture and the law*. International Society of Arboriculture, Savoy, IL 61874.

Miller, Robert. 1988. *Urban forestry: planning and managing urban greenspaces*. Englewood Cliffs: Prentice Hall.

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National Arbor Day Foundation Tree City USA Publications:

No. 1 *How to Prune Young Shade Trees*

[No. 2 *When a Storm Strikes*](#)

No. 3 *Resolving Tree-Sidewalk Conflicts*

[No. 4 *The Right Tree for the Right Place*](#)

No. 5 *Living With Urban Soils*

No. 6 *How to Hire an Arborist*

No. 7 *How to Save Trees During Construction*

No. 8 *Don't Top Trees!*

No. 9 *How to Write a Municipal Tree Ordinance*

No. 10 *Plant Trees for America!*

No. 11 *How to Prevent Tree/Sign Conflicts*

No. 12 *What City Foresters Do*

No. 13 *Trees for Wildlife*

No. 14 *How to Kill a Tree*

[No. 15 *How to Recognize-and Prevent-Hazard Trees*](#)

No. 16 *How to Recycle Shade Tree Materials*

No. 17 *How to Landscape to Save Water*

[No. 18 *Tree City USA Growth Award*](#)

No. 19 *How to Select and Plant a Tree*

No. 20 *A Systematic Approach to Building With Trees*

No. 21 *How Trees Can Save Energy*

[No. 22 *Tree City USA: Foundation for Better Tree Management*](#)

No. 23 *How to Conduct a Street Tree Inventory*

No. 24 *Trees and Parking Lots*

- No. 25 *Tree Line USA*
- No. 26 *Understanding Landscape Cultivars*
- No. 27 *How to Manage Community Natural Areas*
- No. 28 *Placing a Value on Trees*
- No. 29 *How to Plan for Management*
- No. 30 *Ten Tree Myths to Think About*
- No. 31 *Tree Protection Ordinances*
- No. 32 *Let's Stop Salt Damage*
- No. 33 *How to Interpret Trees*
- [No. 34 *How to Fund Community Forestry*](#)
- No. 35 *How to Protect Trees During Underground Work*

JOURNALS AND MAGAZINES

American Nurseryman, 111 N. Canal Street, Suite 545, Chicago, I L 60606-72 76

Arbor Age, P.O. Box 8420, Van Nuys, CA 91409

Arboricultural Journal, International Journal of Urban Forestry: British Arboricultural Association

Grounds Maintenance, P.O. Box 12901, Overland Park, KS 66282

Journal of Arboriculture, Arborists News: International Society of Arboriculture, P.O. Box 66, Savoy, I L 61874

Landscape Management, I East 1st Street, Duluth, MN 55802

Tree Care Industry: National Arborist Association

Urban Forests, American Forests: American Forests

VIDEOS

A Special Kind of Care. National Arbor Day Foundation. 13 minutes.

Creating an Urban Oasis. Missouri Department of Conservation. 20 minutes.

Tree Health Management: Evaluating Trees for Hazard. E. Michael Sharon. USDA Forest Service, Rocky Mountain Region. 39 minutes.

Trees on Main Street. Cooperative Extension, University of Connecticut. Box 70, Haddam, CT 06438 (203)345-4511.

Trees, please! Illinois Department of Conservation. 15 minutes.

Urban Forestry. Texas Agricultural Extension Service. 302 Horticulture and Forest Sciences Building., College Station, TX 77843 (409)845-1351. 25 minutes.

Your Conservation Guide to: Tree Planting and Pruning. Missouri Department of Conservation. 10 minutes.

9.4 Organizations with Resources

American Association of Botanical Gardens and Arboreta, Inc.
P.O. Box 206
Swathmore, PA 19081

American Association of Nurseryman
1240 1 Street, NW, #500
Washington, D.C. 20005
(202) 789-2900

American Forest Council
Suite 320, 1250 Connecticut Avenue, NW
Washington D.C. 20036
(202) 463-2459

American Forests
P.O. Box 2000
Washington, D.C. 20013-2000
(202) 667-3300

American Horticultural Society
7931 East Boulevard Drive
Alexandria, VA 22308
(703) 768-5700

American Planning Association
1313 East 60th Street
Chicago, IL 60637

(312) 955-9100

American Society of Consulting Arborists
3895 Upham Street, #12
Wheat Ridge, CO 80033
(303) 420-9554

American Society of Landscape Architects
4401 Connecticut Avenue, N.W.
Washington D.C. 20007
(202) 686-2752

Association of Consulting Foresters of America
5410 Grosvenor Lane, #205
Bethesda, MD 20814
(301) 530-6795

Center for Environmental Information
99 Court Street
Rochester, NY 14604
(716) 546-3796

Council of Tree and Landscape Appraisers
1250 Eye Street N.W., #500
Washington, D.C. 20005
(202) 789-2421

Heartland Center for Leadership Development
9410 Street, #920
Lincoln, NE 68508
(402) 474-7667

International Society of Arboriculture
P.O. Box GG
Savoy, IL 61874
(217) 328-2032

Land Trust Exchange
1017 Duke Street
Alexandria, VA 22314
(703) 683-7778

Lasting Woodlands, Inc.
Metropolitan Tree Improvement Alliance (METRIA)
c/o Ohio Department of Natural Resources
Foundation Square, Building C
Columbus, OH 43224
(614) 265-6707

Municipal Arborists/Urban Foresters Society (MAUFS)
17 Lafayette Place
P.O. Box 1255
Freehold, NJ 07728-1255
(201) 431-7903

National Arbor Day Foundation
100 Arbor Avenue
Nebraska City, NE 68410
(402) 474-5655

National Arborist Association
P.O. Box 1094
Amherst, NH 03031-1094
(800) 733-2622

National Association of Conservation Districts
509 Capital Court, N.E.
Washington, D.C. 20002
(202) 547-6223

National Association of State Foresters
Hall of the States, #526
444 North Capital Street, N. W.
Washington, D.C. 20001
(202) 624-5415

National Association of Towns and Townships
1522 K Street, N. W., #730
Washington, D.C. 20005
(202) 737-5200

National Institute for Urban Wildlife
10921 Trotting Ridge Way
Columbia, MD 21044

(301) 596-3311

National League of Cities
1801 Pennsylvania Avenue, N. W.
Washington, D.C. 20004
(202) 626-3000

National Recreation and Parks Association
3101 Park Center Drive
Alexandria, VA 22302
(703) 820-4940

National Urban Forest Council
c/o American Forests
P.O. Box 2000
Washington, D.C. 20013
(202) 667-3300

National Urban Forestry Program
State and Private Forestry
U. S. Department of Agriculture Forest Service
P.O. Box 96090
Washington, D.C. 20090-6090
(202) 447-6657

The National Volunteer Center
1111 North 1 9th Street, #500
Arlington, VA 22209
(703) 276-0542

Partners for Livable Places
1429 21st Street, N. W.
Washington, D.C. 20036
(202) 887-5990

The Points of Light Foundation
736 Jackson Place
Washington, D.C. 20503
(202) 408-5162

Small Towns Institute
P.O. Box 517

Ellensburg, WA 98926
(509) 925-1830

Society of American Foresters
5400 Grosvenor Lane
Bethesda, MD 20814
(301) 897-8720

Society of Municipal Arborists
975 Pennsylvania Avenue
University City, MO 63130
(314) 862-6767

Soil and Water Conservation Society
7515 Northeast Ankeny Road
Ankeny, IA 50021-9764
(515) 289-2331

Urban Land Institute
1090 Vermont Avenue N. W., #300
Washington, D.C. 20005
(202) 624-7000

Utility Arborist Association
c/o International Society of Arboriculture
P.O. Box GG
Savoy, IL 61874
(217) 328-2032

9.5 50 State Forestry Offices

Alabama

State Forester
Alabama Forestry
Commission
513 Madison Avenue (205) 240-
Montgomery, AL 36130 9304

Alaska State Forester
 Division of Forestry
 Pouch 7-005 (907) 762-
 Anchorage, AK 99501 2501

Arizona State Forester
 State Land Department
 1624 West Adams (602) 542-
 Phoenix, AZ 85007 2515

Arkansas State Forester
 Arkansas Forestry
 Commission
 3821 West Roosevelt Road
 P.O. Box 4523 Asher
 Station (501) 664-
 Little Rock, AR 72204 2531

California Director
 Department of Forestry &
 Fire Protection
 Resources Building, #1505
 1416 Ninth Street (916) 653-
 Sacramento, CA 95814 7772

Colorado State Forester
 Colorado State Forest
 Service
 Colorado State University
 203 Forestry Building (303) 491-
 Fort Collins, CO 80523 6303

Connecticut State Forester
 Bureau of Forestry
 Department of
 Environmental Protection
 165 Capitol Avenue (203) 566-
 Hartford, CT 06106 5348

<u>Delaware</u>	State Forester Forestry Section Department of Agriculture 2320 South Dupont Highway Dover, DE 19901	(302) 736- 4811
<u>Florida</u>	Director Division of Forestry 3125 Conner Boulevard Tallahassee, FL 32399- 1650	(904) 488- 4274
<u>Georgia</u>	Director Georgia Forestry Commission P.O. Box 819 Macon, GA 31298-4599	(912) 751- 3480
<u>Guam</u>	Chief Forestry & Soil Resources Division Department of Agriculture P.O. Box 23367 GMF, GUAM 96921	(607) 734- 3948
<u>Hawaii</u>	Administrator Hawaii Division of Forestry & Wildlife 1151 Punchbowl Street Honolulu, HI 96813	(806) 587- 0166
<u>Idaho</u>	Director Idaho Department of Lands State Capitol Building 1215 West State Street Boise, ID 83720	(208) 334- 0200

Illinois

State Forester
 Division of Natural
 Resources
 Northwest Office Plaza
 600 Grand Avenue West (217) 782-
 Springfield, IL 62706-1787 2361

Indiana

State Forester
 Division of Forestry
 Department of Natural
 Resources
 402 West Washington
 Street, #296 (317) 232-
 Indianapolis, IN 46204 4105

Iowa

State Forester
 Department of Natural
 Resources
 Wallace State Office
 Building
 Des Moines, IA 50319- (515) 281-
 0034 8656

Kansas

State/Extension Forester
 Forestry Building
 2610 Claflin Road (913) 537-
 Manhattan, KS 66502 7050

Kentucky

Director
 Division of Forestry
 627 Comanche Trail (502) 564-
 Frankfort, KY 40601 4496

Louisiana

State Forester
 Office of Forestry
 P.O. Box 1628 (504) 925-
 Baton Rouge, LA 70821 4500

Maine

State Forester
Maine Forest Service
Department of
Conservation
State House Station #22 (207) 289-
Augusta, ME 04333 2791

Maryland

State Forester
Maryland Department of
Natural Resources
Resource Conservation
Service - Forestry Division
Tawes State Office
Building
580 Taylor Avenue (301) 974-
Annapolis, MD 21401 3776

Massachusetts

State Forester
Division of Forests and
Parks
Department of
Environmental
Management
100 Cambridge Street (617) 727-
Boston, MA 02202 8893

Michigan

State Forester
Forest Management
Division
Michigan Department of
Natural Resources
Stevens T. Mason
Building, Box 30028 (517) 373-
Lansing, MI 48909 1275

Minnesota

State Forester
Division of Forestry
Box 44, DNR Building
500 Lafayette Road (651) 296-
St. Paul, MN 55155-4044 4484

Mississippi

State Forester
 Mississippi Forestry
 Commission
 301 Building, #300 (601) 359-
 Jackson, MS 39201 1388

Missouri

State Forester
 Missouri Department of
 Conservation
 2901 West Truman
 Boulevard
 P.O. Box 180
 Jefferson City, MO 65102- (314) 751-
 0180 4115

Montana

State Forester
 Department of State Lands
 Division of Forestry
 2705 Spurgin Road (406) 542-
 Missoula, MT 59801 4300

Nebraska

State Forester
 University of Nebraska
 Department of Forestry,
 Fish & Wildlife
 Institute of Agriculture &
 Natural Resources
 Room 101, Plant
 Industries Building (402) 472-
 Lincoln, NE 68585 2944

Nevada

State Forester
 Division of Forestry
 201 South Fall Street (702) 687-
 Carson City, NV 89710 4353

New Hampshire Director
 Division of Forests and
 Lands
 Box 856
 172 Pembroke Road (603) 271-
 Concord, NH 03301 2214

New Jersey State Forester
 New Jersey Forest Service
 CN-404 (609) 292-
 Trenton, NJ 08625 2520

New Mexico State Forester
 Division of State Forestry
 P.O. Box 2167 (505) 627-
 Santa Fe, NM 87504-2167 5830

New York Director
 Division of Lands and
 Forests
 Department of
 Environmental
 Conservation
 50 Wolf Road (518) 457-
 Albany, NY 12233-1010 2475

North Carolina Director
 Division of Forest
 Resources
 P.O. Box 27687 (919) 733-
 Raleigh, NC 27611 2162

North Dakota State Forester
 North Dakota Forest
 Service
 First & Brander (701) 228-
 Bottineau, ND 58318 2277

Ohio State Forester
 Division of Forestry
 Fountain Square (614) 265-
 Columbus, OH 43224 6690

Oklahoma State Forester
 Oklahoma Department of
 Agriculture
 Forestry Division
 2800 North Lincoln
 Boulevard (405) 521-
 Oklahoma City, OK 73105 3864

Oregon State Forester
 Department of Forestry
 2600 State Street (503) 945-
 Salem, OR 97310 7211

Pennsylvania State Forester
 Bureau of Forestry
 P.O. Box 8552
 Harrisburg, PA 17105- (717) 787-
 8552 2703

Puerto Rico State Forester
 Department of Natural
 Resources
 P.O. Box 5887
 Puerta De Tierra
 San Juan, Puerto Rico (809) 724-
 00906 3647

Rhode Island Division of Forest
 Environment
 1037 Hartford Pike (401) 647-
 North Scituate, RI 02857 3367

South Carolina State Forester
 South Carolina
 Commission of Forestry
 P.O. Box 21707 (803) 896-
 Columbia, SC 29221 8800

South Dakota Director
 Division of Forestry
 Department of Game, Fish
 & Parks
 Siguard Anderson
 Building
 445 East Capitol Street (605) 773-
 Pierre, SD 57501 3623

Tennessee State Forester
 Division of Forestry
 701 Broadway
 P.O. Box 40627 (615) 360-
 Nashville, TN 37204 0722

Texas Director
 Texas Forest Service
 301 Tarrow Street (409) 845-
 College Station, TX 77843 2641

Utah Director State Forester
 Division of State Lands &
 Forestry
 3100 State Office Building
 355 West North Temple (801) 538-
 Salt Lake City, UT 84114 5508

Vermont State Forester
 Division of Forests
 Department of Forests,
 Parks & Recreation
 Waterbury State Complex
 103 South Main Street
 Waterbury, VT 05671

Virgin Islands Director
 Virgin Islands Forestry
 Program
 P.O. Box U, Kingshill
 St. Croix, U.S. Virgin Islands 00850 (809) 778-0997

Virginia State Forester
 Virginia Department of
 Forestry
 P.O. Box 3758 (804) 977-6555
 Charlottesville, VA 22903

Washington Supervisor
 Department of Natural
 Resources
 202 Public Lands Building
 Box 4 7001, 1111
 Washington Street (206) 902-1000
 Olympia, WA 98504

West Virginia State Forester
 Deputy Administrative
 Forester
 West Virginia Department
 of Commerce
 Labor and Environmental
 Resources
 Building 1, Room R 151
 1900 Kanawha Boulevard,
 East
 Charleston, WV 25305-0180 (304) 558-3446

Wisconsin Chief State Forester
 101 South Webster Street
 P.O. Box 7921 (608) 266-0842
 Madison, WI 53707

Wyoming

State Forester
Wyoming State Forestry
Division
110 West 22nd Street (307) 777-
Cheyenne, WY 82002 7580

9.6 Federal Emergency Management Agency (FEMA) Offices

National Office
State and Local Programs and Support Directorate
Office of Disaster Assistance Programs
Washington D.C. 20472
(202) 646-3615

FEMA - Region I

J. W. McCormack Post Office and Courthouse Building, Room 442
Boston, MA 02109
(617) 223-9540

For states: Connecticut, Maine, Massachusetts, Rhode Island, Vermont

FEMA - Region II

26 Federal Plaza, Room 1338
New York, NY 10278
(212) 238-8309

For states: New Jersey, New York, and for Puerto Rico, Virgin Islands

FEMA - Region III

Liberty Square Building, 2nd Floor
105 South Seventh Street
Philadelphia, PA 19106
(215) 931-5500

For states: Delaware, Maryland, Pennsylvania, Virginia, West Virginia, and for District of Columbia

FEMA - Region IV

1371 Peachtree Street, Northeast, #700
Atlanta, GA 30309
(404) 853-4200

For states: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

FEMA - Region V

175 West Jackson Boulevard, 4th Floor
Chicago, IL 60604-2698
(312) 408-5500

For states: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

FEMA - Region VI

Federal Regional Center, Room 206
800 North Loop 288
Denton, TX 76201-3698
(817) 898-9399

For states: Arkansas, Louisiana, New Mexico, Oklahoma, Texas

FEMA - Region VII

911 Walnut Street, Room 200
Kansas City, MO 64106
(816) 283-7061

For states: Iowa, Kansas, Missouri, Nebraska

FEMA - Region VIII

Denver Federal Center, Building 710
Box 25267
Denver, CO 80225-0267
(303) 235-4811

For states: Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

FEMA - Region IX

Disaster Assistance Programs
Building 105
Presidio of San Francisco, CA 94129
(415) 923-7100

For states and territories: American Samoa, Arizona, California, Guam,
Hawaii, Nevada, Trust
Territory of the Pacific Islands, Commonwealth of the Northern Mariana
Islands, Federated
States of Micronesia

FEMA - Region X
Federal Regional Center
130 228th Street, SW
Bothell, WA 98021-9796
(206) 487-8800

For states: Alaska, Idaho, Oregon, Washington

9.7 State Offices Responsible for Disaster Operations

Director, Alabama Emergency Management Agency
520 South Court Street
Montgomery, Alabama 36130
Telephone: (205) 834-1375

Director, Alaska Division of Emergency Services
Department of Military Veterans Affairs
3501 E. Bogard Road
Wasilla, Alaska 99687-2689
Telephone: (907) 376-2337

Disaster Program Coordinator, Department of Public Safety
American Samoa Government
Fagatogo, American Samoa 96799
Telephone: 011-684-633-2331

Director, Arizona Division of Emergency Services
National Guard Building
5636 East McDowell Road
Phoenix, Arizona 85008

Telephone: (602) 244-0504

Director, Office of Emergency Services
P.O. Box 758
Conway, Arkansas 72032
Tel. (501) 329-56501/Ext. 201
(501) 374-1201 (Little Rock)

Director, California Office of Emergency Services
P.O. Box 9577
Sacramento, California 95823
Telephone: (916) 427-1624

Director, Disaster Emergency Services
EOC, Camp George West
Golden, Colorado 80401
Telephone: (303) 273-1624

State Director, Office of Emergency Management
360 Broad Street
Hartford, Connecticut 06105
Telephone: (203) 566-3180

Director, Division of Emergency Planning and Operations
P.O. Box 527
Delaware City, Delaware 19706
Telephone: (302) 834-4531

Director, Office of Emergency Preparedness
District of Columbia Government
2000 14th Street, NW, 8th Floor
Washington, D.C. 20009
Telephone: (202) 727-6161

Director, Division of Emergency Management
2740 Crestview Drive
Tallahassee, Florida 32399
Telephone: (904) 487-4918

Executive Director, Georgia Emergency Management Agency
P.O. Box 18055
Atlanta, Georgia 30316-0055

Telephone: (404) 624-7000

Director, Civil Defense Territory of Guam Emergency Services
P.O. Box 2877
Agana, Guam 96910
Telephone: (515) 272-5211

Vice Director of Civil Defense, Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816
Telephone: (808) 734-2161

Coordinator, Bureau of Disaster Services
Military Division
650 West State Street
Boise, Idaho 96816
Telephone: (808) 734-2161

Director, Illinois Emergency Services and Disaster Agency
110 East Adams Street
Springfield, Illinois 62706
Telephone: (217) 782-6818

Director, Indiana Department of Civil Defense and Emergency
Management
State Office Building, B-90
100 North Senate Avenue
Indianapolis, Indiana 46204
Telephone: (317) 232-3830

Deputy Director, Division of Emergency Preparedness
P.O. Box C-300
Topeka, Kansas 66601
Telephone: (913) 233-9253/Ext. 301

Executive Director, Kentucky Disaster and Emergency Services
Boone Center
Parkside Drive
Frankfort, Kentucky 40601
Telephone: (502) 564-8680

Assistant Secretary, Office of Emergency Preparedness

Department of Public Safety
P.O. Box 66536
Audubon Station
Baton Rouge, Louisiana 70896
Telephone: (504) 342-5470

Director, Maine Emergency Management Agency
State Office Bldg., Station 72
Augusta, Maine 04333
Telephone: (207) 289-4080

Disaster Control Officer, Office of the Governor
Commonwealth of the Northern Mariana Islands
Saipan, Mariana Islands 96950
Tel. 011-670-322-9529/9572

Chief, Office of Planning and Statistics
Office of the High Commissioner
Trust Territory Headquarters
Saipan, Mariana Islands 96950
Telephone: 011-670-322-9333

Disaster Control Officer
Republic of the Marshall Islands
Majuro, Marshall Islands 96960
Telephone: 93-011-692-0-3234

Director, Maryland Emergency Management and Civil Defense
Agency
Two Sudbrook Lane
East Pikesville, Maryland 21208
Telephone: (301) 486-4422

Director, Massachusetts Civil Defense Agency and Office of
Emergency Preparedness
P.O. Box 1496
400 Worcester Road
Framingham, Massachusetts 01701
Telephone: (508) 820-2000

Deputy State Director, Emergency Management Division
Michigan State Police Department

300 S. Washington Sq., #300
Lansing, Michigan 48913
Telephone: (517) 334-7950

Director, Disaster Control Office
The Federated States of Micronesia 96941
Telephone: (011) 691-9228

Director, Division of Emergency Management Agency
Department of Public Safety State Capitol, B-5
St. Paul, Minnesota 55155
Telephone: (612) 296-2233

Director, Mississippi Emergency Management Agency
P.O. Box 4501
Fondren Station Jackson, Mississippi 39216
Telephone: (601) 352-9100

Director, State Emergency Management Agency
P.O. Box 116
Jefferson City, Missouri 65102
Telephone: (314) 751-9571

Administrator, Disaster and Emergency Services Division
Department of Military Affairs
P.O. Box 4789
Helena, Montana 59604
Telephone: (406) 444-6911

Assistant Director, Nebraska Civil Defense Agency
National Guard Center
1300 Military Road
Lincoln, Nebraska 68508
Telephone: (402) 473-1410

Director, Nevada Division of Emergency Services
Military Department
2525 South Carson Street
Capitol Complex
Carson City, Nevada 89710
Telephone: (702) 885-4240

Director, Governor's Office of Emergency Management
State Office Park South
107 Pleasant Street
Concord, New Hampshire 03301
Telephone: (603) 271-2231

Deputy State Director, Office of Emergency Management
New Jersey State Police
Dept. P.O. Box 7068
West Trenton, New Jersey 08628
Telephone: (609) 882-2000

Director, Technical and Emergency Support Division
Department of Public Safety
4491 Ceffillos Road
P.O. Box 1628
Santa Fe, New Mexico 87504
Telephone: (505) 827-3375

Director, State Emergency Management Office
Division of Military and Naval Affairs
Public Security Building, State Campus
Albany, New York 12226-5000
Telephone: (518) 457-2222

Director, State Division of Emergency Management
Administration Building
116 West Jones Street
Raleigh, North Carolina 27611
Telephone: (919) 733-3867

Director, State Division of Emergency Management
P.O. Box 5511
Bismarck, North Dakota 58502-5511
Telephone: (701) 224-2111

Deputy Director, Ohio Emergency Management Agency
2825 W. Granville Road
Columbus, Ohio 43235-2712
Telephone: (614) 889-7155

Deputy Director, Oklahoma Civil Defense Agency

P.O. Box 53365
Oklahoma City, Oklahoma 73152
Telephone: (405) 521-2481

Administrator, Emergency Management Division
Oregon State Executive Department
43 State Capitol Building
Salem, Oregon 97310
Telephone: (503) 378-4124

Director, Pennsylvania Emergency Management Agency
Transportation and Safety Building
Room B-151
Harrisburg, Pennsylvania 17120
Telephone: (717) 783-8150

Director, Office of Civil Defense
P.O. Box 5127
San Juan, Puerto Rico 00906
Telephone: (809) 724-0124

Executive Director, Rhode Island Emergency Management Agency
State House - Room 27
Providence, Rhode Island 02903
Telephone: (401) 421-7333

Director, Emergency Preparedness Division
1429 Senate Street
Columbia, South Carolina 29201
Telephone: (803) 734-8020

Director, Division of Emergency and Disaster Services
Department of Military Affairs
EOC-State Capitol
Pierre, South Dakota 57501
Telephone: (605) 773-3231

Director, Tennessee Emergency Management Agency
3041 Sidco Drive
Nashville, Tennessee 37204
Telephone: (615) 252-3300

State Coordinator, Division of Emergency Management
Texas Department of Public Safety
Box 4087, North Austin Station
Austin, Texas 78773
Telephone: (512) 465-2000/Ext. 2138

Director, Division of Comprehensive Emergency Management
Department of Public Safety
1543 Sunnyside Avenue
Salt Lake City, Utah 00820
Telephone: (801) 533 -5271

Director, Virgin Islands Territorial Emergency Management
Agency
3-4 King Street
Christiansted, St. Croix
U.S. Virgin Islands 00820
Telephone: (809) 774-2244

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Chapter 10

References

10.1 Chapter Outline

- I. Literature Review
 - A. General Reviews
 - B. Disaster Planning
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10.2 Literature Review

A recently published document by the Council of Planning Librarians entitled "Planning for high-wind disasters: tornadoes, hurricanes and severe storms, a partially annotated bibliography" annotates and lists books, compendia, journal articles, reports, symposia and related publications (Obermeyer 1989). This document would serve as an excellent resource for disaster mitigation planners. Note that American Forests, The International Society of Arboriculture and The National Arbor Day Foundation citations are not included in Obermeyer's compilation.

After reviewing the work by Obermeyer and others, documents were found to be listed under three categories related to managing the urban forest to mitigate natural disasters. These references include: 1) general reviews, 2) disaster planning, and 3) disaster recovery.

A. GENERAL REVIEWS

Nalivkin's (1982) work provides a global review of natural disasters. He cites a broad array of disasters and their geographic affinities as well as geological relationships. Nalivkin provides numerous examples of dust storms, floods, hail and ice damage, hurricanes, snowstorms, tornadoes, and thunderstorm squalls which

were documented and recorded as occurring in the northeastern United States. He uses lithographs, aerial and surface photographs, and diagrams of fallen tree positions to illustrate and support his text.

Gibilsco (1984) wrote an excellent, popularized narration of storms and violent weather. In his descriptions and portrayals, he includes how to avert flood damage, how to prepare for hurricanes and tornadoes, and how to survive a blizzard.

B. DISASTER PLANNING

Foster's (1980) thesis on disaster planning emphasizes safety and the preservation of life and property. He promotes an urban community scenario which emphasizes that municipal staff, equipment and information is usually available to implement many of the stages of disaster mitigation. He stresses, however, that a redefinition of departmental roles, a change in emphasis, and a strong commitment to achieve safety goals would attain a higher disaster mitigation profile. Foster emphasizes the spatial distribution of risk, safety by design, predicting and preventing disaster, and developing warning systems, as well as disaster plans.

At the basic level of local government, Herman (1982) insists on the careful organization of disaster plans, people and resources. He includes training for disasters, how to staff an operations center and how to coordinate with other agencies and organizations. He describes the elements of disaster mitigation preparation. Herman also lists voluntary organizations concerned with disaster service. Additionally, he cites U.S. Environmental Protection Agency regional offices and state emergency management agencies. Note: the majority of volunteer, federal and state offices with their telephone numbers, which he cataloged, are still current.

C. DISASTER RECOVERY

"*Community recovery from a major natural disaster*" by Rubin *et al.* (1985) examined 14 case studies of large and small communities which were affected by and recovered from, one of the natural disaster categories cited by Nalivkin. Fort Wayne, Indiana, as an example, suffered severe flood damage in March, 1982. Damage sustained was \$50 million. Ten days after the March 13 inundation,

the Mayor's office issued an interdepartmental memo describing a four-phase flood recovery strategy. Phase I analyzed Fort Wayne's response to the flood; Phase II, led by an outside consultant, dealt with public recovery issues, including disaster survey reports and relief issues; Phase III was scheduled for a 30-day effort to produce a local mitigation plan; and Phase IV prepared for a "Flood Festival" to thank flood volunteers for their assistance. Results of this four-phase mitigation operation for a city of 172,000 residents were outstanding, but activities took longer than planned and were more expensive than anticipated.

Our literature review concerning disaster recovery, both for large and small municipalities, found that most of the authors' concentrated on 1) crisis intervention (Tierney and Baisden, 1979); 2) disaster analysis (Wright *et al.*, 1979); 3) ethical as well as policy issues pertaining to emergency management (Comfort *et al.*, 1988); 4) mental health of impacted populations (Laube and Murphey, 1985); and 5) social repercussions (Friesema *et al.*, 1979). Virtually no evaluation research has been conducted on environmental benefits, monetary costs, psychological amenities, or social impacts which relate to the replanting of urban trees and forests after a disaster.

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Chapter 11

Appendix - Key Words

A

Arboriculture - Planting and care of individual trees.

Arborist - A professional who practices arboriculture.

Arborists News - Bimonthly arboricultural journal published by the International Society of Arboriculture.

Administration - Act of execution of laws or programs.

American Forests (AF) - Bimonthly forestry magazine which often features urban forestry articles.

Area Director - Individual responsible for all Forest Service State and Private Forestry programs in the Northeastern Area.

Assessment - To set an environmental or financial value of urban forests on trees.

B

Beautification Council - Local volunteer group concerned with planting landscape trees, shrubs and vegetation.

C

Case Study - Specific analysis and description of a program or project.

Communication - To convey or share information.

Community/Communities - Aggregation of citizens who own or rent property.

Coordination - Group action to achieve a common goal or objective.

D

Disaster Field Office (DFO) - Central location for the coordination of a Federally Declared Disaster relief and recovery effort.

Damage Survey Report (DSR) - Written assessment of the estimated disaster relief and recovery effort.

E

Early Warning - An advisory system which provides several hours of advance, severe-weather notification.

Economics - Costs or values of trees within the urban forest.

Emergency Storm Response Plan - A system based on experience, which codifies and simplifies the reaction to a disaster.

F

Federal Emergency Management Agency (FEMA) - Federal agency that works with local communities and states in response to natural disasters.

Federal Coordinating Officer (FCO) - Federal agent responsible for managing FEMA response to natural disasters.

Federal Declaration of Disaster - Official Presidential notification advising that an area or region has encountered a major natural disaster.

H

Hurricane - A larger-scale regional windstorm with wind velocities of 80 m.p.h. or greater.

I

Illinois Department of Conservation (IDOC) - A state agency which manages and assists that management of forest resource areas including urban forests.

Ice Storm - Slow accumulation of layers of ice on tree branches with consequent breakage and damage.

Interagency Hazard Mitigation Team (IHMT) - Group of local, state and federal individuals who work together to identify and make recommendations for ways to reduce damage in future disasters.

Immediate Reaction - Measures to remove downed trees and other related debris from major streets and avenues.

International Society of Arboriculture (ISA) - An association of 7,000 members concerned with urban tree management.

Inventory - A systematic listing of urban trees identified by species, condition and municipal location.

J

Journal of Arboriculture - Scientific publication concerned with the management of urban trees.

L

Large-sized Community - Human population of 50,001 to 7,000,000 individuals.

Life-threatening Situations - Hazardous trees, created by violent weather, which may fall on houses or pedestrians.

M

Major Tree Damage Control Plan - Component of the early warning system of Oak Park.

Media - Newspapers, radio, TV and related news transmitting agencies.

Mitigation - Activities which eliminate or reduce the occurrence of natural disasters.

Mitigation Categories - Eleven subjects which enhance the concept of mitigation.

Medium-sized Community - Human population of 10,001 -50,000 individuals.

Monitoring - Reduces conflicts of interest by facilitating information and feedback leading to cooperation and coordination.

Municipal Leaders - Elected officials and volunteer laypersons concerned about trees.

N

National Arbor Day Foundation (NADF) - A non-profit organization of 1 million members interested in tree programs.

National Weather Service - A Federal agency which provides alerts and warning systems which advise of approaching natural disasters.

Natural Disaster - Includes damage created by high winds, hurricanes, tornadoes, ice, snow and floods.

Northeastern Area State and Private Forestry (NA S&PF) - Forest Service branch that works with the 20 northeastern states.

O

Operation Tornado ReLeaf - A Northern Illinois community tree planting program to mitigate damage of a severe tornado.

P

Preliminary Damage Assessment (PDA) - An immediate, systematic survey of storm damage resulting from a natural disaster.

Planning - Anticipating future requirements and expenditures which would mitigate natural disasters.

Preparedness - Getting ready to meet and to solve problems which accompany a natural disaster.

Professional Training - Programs to meet and to solve problems which accompany a natural disaster.

Public Participation - Efforts of volunteer leaders and organizations to re-establish the urban forest.

R

Recovery - Restoration of services and treescapes related to the urban forest.

Regreening - Synonymous with re-establishing the urban forest.

Research - Careful investigation of earlier storm recovery effort successes and failures.

Response - Positive reaction to a natural disaster by well-trained urban foresters or public works employees.

S

State Emergency Management Agency (SEMA) - State-level organization responsible for disaster management and assistance.

Severe Storm - An emergency that requires special equipment and management for solution.

Small-sized Community - Human population of 100-100,000 individuals.

State Declaration of Disaster - The situation where local authorities contact the SEMA and it is determined that the Governor will declare the area a disaster.

Structural Mitigation - Actual engineering procedures or methodologies which enhance mitigation.

T

Tornado - A cyclonic windstorm with central velocities over 100 m.p.h.

Tree City USA - A community which meets four arboricultural standards established by the NADF.

Tree City USA Bulletin - One of a series of 8-page arboricultural informational brochures.

Tree City USA Growth Award - A certified Tree City USA which also meets higher levels of tree maintenance.

Tree Expert Firm - a private entrepreneur whose company practices arboriculture and urban forestry.

U

Urban Forest - Woody and associated vegetation in and about human settlements.

Urban Forester - A professional who has special education and training to manage the urban forest.

Urban Forestry - Management of the total aggregation of trees found in a given

community.

Urban Planner - A specialist concerned with design and planning of communities and cities.

V

Volunteer Tree Projects - Tree planting or maintenance undertaken by non - professional volunteers.

W

Weather-warning Agencies - Governmental or commercial meteorological units with special capacity to monitor approaching storms.

Windstorm - A storm characterized by high wind of specific velocity but without appreciable precipitation.

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FLOODING **and its effects on TREES**

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Forest Health Protection State Cooperators
Federal Emergency Management Agency Offices
State Emergency Management Agency Offices
State Extension Offices

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Levee Armoring: Woody Biotechnical Considerations for Strengthening Midwest Levee Systems

- By Douglas Wallace, Clifford Baumer, John Dwyer and Frank Hershey

Forestry Strategies to Protect Floodplain Agricultural Systems

- By Frank Hershey, Douglas Wallace and John Dwyer

Tree Planting Enterprises on Flood-Damaged Farmland

- By John Dwyer, Douglas Wallace and Frank Hershey



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FLOODING and its effects on TREES

Introduction

The 1993 floods along the Missouri and Mississippi Rivers and their tributaries have caused tremendous losses in terms of human life, homes, businesses and crop production. Bottomland areas have been under water for many weeks. Landowners, homeowners, foresters, park managers, and others are concerned about the long-term effect of the flooding on the forests of the Midwest and the Great Plains.

Purpose and Use of Resource Packet

The purpose of this resource packet is twofold. First, the packet is intended to assist on-the-ground natural resource professionals answer flood-related tree questions in both rural and urban areas. Second, the packet can serve the resource professional as a depository for future flood-related publications and information.

FLOODING and its effect on TREES is divided into five sections.

- **Section 1** addresses the interaction of soil, tree, and flood characteristics and provides flood tolerance ratings for over 90 tree and shrub species.

Section 2 focuses on the major insect and disease problems that might be expected on trees following flooding. Symptoms of stress and pest damage are provided including recommended management practices.

Section 3 deals with management implications of flooded trees and forest stands. Information is provided on tree recovery, factors affecting management, and salvage considerations.

Section 4 provides names and addresses for state-level technical assistance pertaining to tree and forest-related flood management and recovery.

Section 5 is a bibliography of all references used in the production of this resource packet.

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FLOODING and its effects on TREES

Flood Tolerance of Trees

Numerous studies have been conducted to help foresters and natural resource managers understand the impact of flooding on trees (see bibliography). The state-of-the-art, however; has not developed sufficiently to warrant a precise statement on the adaptability of a species to a specific flooding situation. Conclusions from different studies are often contradictory, caused in part by the physiological responses of the tree as it interacts with environmental conditions. Since these environmental conditions are not well understood, as well as the difficulty in categorizing tree species over their entire range, flood tolerance predictions must be carefully evaluated in general terms. A brief review of soil, tree, and flood characteristics indicates the complexity of these interactions.

Soils

The following soil-related points are important in understanding flooding effects on trees.

- **Soil Aeration**

Flooding results in poor soil aeration because the supply of oxygen to flooded soil is severely limited. Oxygen deficiency is likely the most important environmental factor that triggers growth inhibition and injury in flooded plants.

pH

Flooding of soil increases the pH of acid soils and decreases the pH of alkaline soils.

Organic Matter

The rate of decomposition of organic matter in flooded soil tends to be only half that in an unflooded soil. The major end products of decomposition of organic matter in flooded soils are carbon dioxide, methane, and humic materials. In addition, high concentrations of ethanol and hydrogen sulfide are produced in waterlogged soils which can be damaging to root systems.

Sedimentation

Deposits of silt or sand as shallow as three inches may seal over and smother tree

roots by limiting the supply of oxygen. Species vary in tolerance to sedimentation, but all seedlings are susceptible to root injury. Eastern cottonwood, baldcypress, tupelo, and black willow seedlings can withstand moderate siltation.

Scouring

Strong currents, waves, or suspended particulates may cause soil around the base of the tree to be washed away, exposing tree roots. Exposed roots can lead to not only tree stress but can make the tree more vulnerable to windthrow.

Trees

Various characteristics of a tree affect its flood tolerance with the most prominent presented below.

- **Height**

Tree injury increases in proportion to the percent of crown covered by water. Species that can survive standing in several feet of water for months may die in less than one month when their foliage is completely covered. Few species can tolerate more than one month of complete submersion during the growing season.

Crown Class

Trees in the dominant crown class survive flooding much better than trees in lower crown classes.

Age

Adult trees tolerate flooding better than overmature trees or seedlings of the same species. Therefore, some species rated as flood tolerant may be quite sensitive in the seedling stage. Seedlings often die because they are pushed over, buried in mud, or uprooted.

Vigor

Tree vigor at time of flooding influences tolerance. Vigorously growing, healthy trees withstand flooding better than less vigorous trees. Tree vigor may be irrelevant, however; if the tree is totally submersed in water.

Roots

Long-term flooding leads to death and decay of large portions of a tree's root system (see section on Management Implications for windthrow problems). During flooding, some species can maintain normal roots in an active or dormant condition; others rely upon new secondary and adventitious roots that may form from the root collar or on the trunk near the water surface. Species unable to either maintain normal roots or grow new ones can quickly die.

Species Variations

Flood tolerance variations within a species are not well understood. Flood tolerance may be an inherited trait and this may explain some of the discrepancies in reports on survival. (Research methodologies also may vary from one study to another; contributing to contradictory conclusions). However, it is generally accepted that some species have greater tolerance for flooding than others (see Tables 1, 2, and 3).

Floods

Determining flood tolerance is complicated by the diverse characteristics of floods.

- **Season**

Flooding during the growing season usually is more harmful to woody plants than flooding during the dormant season. Specifically, trees are most susceptible to flooding in late spring just after the first flush of growth. The timing of a spring flood influences species differentiation. For example, since silver maple flushes earlier than green ash, an early flood might be more damaging to silver maple while a later flood more injurious to green ash.

Duration

The longer trees are exposed to flooding, the greater the potential for injury. Most trees can withstand only 1-4 months with water being continuously over the soil surface. Short periods of flooding during the growing season can be tolerated by most trees. However, if flooding is recurrent and keeps the soil saturated or prevents recovery from previous flooding, injuries will accumulate and serious damage may occur.

Water Level

The depth of water influences flood tolerance. The mortality rate is less for trees in saturated soils than for trees with water covering the soil. After water covers the soil, the depth may have little significance until the lower foliage is covered; research results, however; differ on this point. Tolerance to complete submersion is much lower than tolerance to shallower depths of water.

Temperature and Oxygen

Cold water is less injurious than warm water due to cold water's capacity to hold more dissolved oxygen. Rapidly flowing water (with higher oxygen content) is less harmful than stagnant water.

Mechanical injuries

An often overlooked aspect of flood damage is mechanical injury caused by current, wave action, and floating debris. Young tree plantings may be especially damaged by current and wave action. Floating debris can injure both small and large trees.

Chemicals

Floods may carry various chemicals that have been picked up as runoff from agricultural fields and other areas or from sewage released when treatment facilities become unable to handle large volumes of water. The impact depends upon the type and dosage of chemicals.

Tolerance Categories

Table 1 and **Table 2** present a summary of the research pertinent to flood-tolerant trees and shrubs for three geographical divisions (districts) of the U.S. Army Corps of Engineers: Lower Mississippi Valley, Missouri River; and North Central (see Figure 1). These three divisions include a majority of the forestland flooded during 1993.

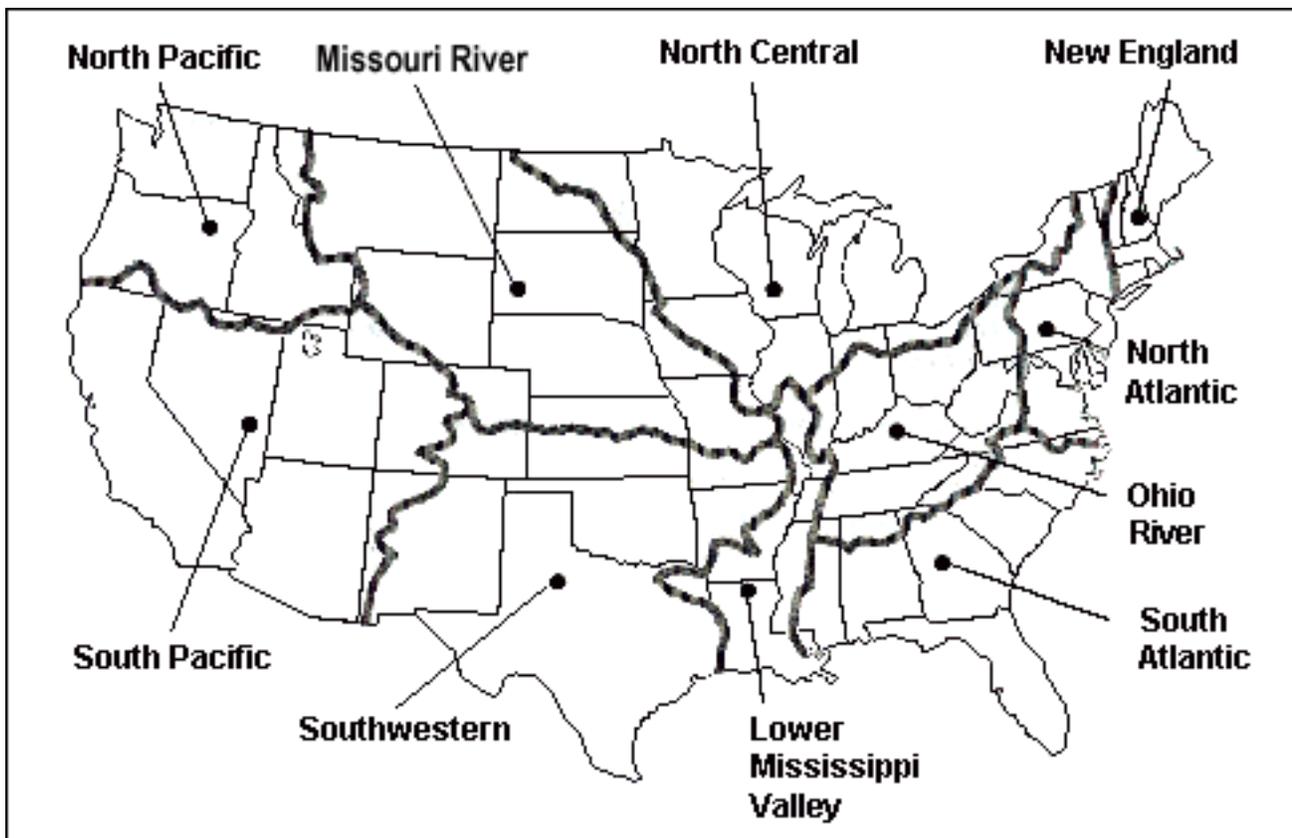


Table 1 combines research results from the Lower Mississippi Valley and the Missouri River divisions. Since classification is relative, flood tolerances are best viewed as overlapping from one tolerance category to the next. Where research results differed between Lower Mississippi Valley and Missouri River studies, species are classified into two tolerance categories. The tolerance categories in Table 1 should be interpreted as

follows:

Very Tolerant	Able to survive deep, prolonged flooding for more than one year.
Tolerant	Able to survive deep flooding for one growing season, with significant mortality occurring if flooding is repeated the following year.
Somewhat Tolerant	Able to survive flooding or saturated soils for 30 consecutive days during the growing season.
Intolerant	Unable to survive more than a few days of flooding during the growing season without significant mortality.

Table 2, which presents the results of an Illinois study, is the most comprehensive in the North Central Division. It is important to note that the flood tolerance categories in Table 2 differ from Table 1 in both name and definition. Table 2 tolerance categories should be interpreted as follows:

Tolerant	Most individuals survived more than 150 days of flooding during the growing season.
Somewhat Tolerant	Some individuals killed by less than 90 days of flooding and some individuals survived greater than 150 days of flooding.
Slightly Tolerant	Most individuals survived more than 50 days but less than 100 days of flooding.
Intolerant	Severe effects with less than 50 days of flooding.

Table 3 provides flood tolerance ratings for cultivated woody plants in New York subjected to a growing season flood (June 1972). The species listed in Table 3 are

commonly available in the landscape trade and are frequently used in park landscapes and urban settings in the Midwest and the Great Plains. Because Table 3 is based on a short duration flood (10 days), information on the intolerant species (those killed or damaged) will be of the most use to practitioners.

It should be noted that Tables 1-3 classify tree and shrub species tolerance relative to continuous, rather than intermittent, flooding. Some species, for example, might tolerate one year of continuous inundation but only 3-4 months of intermittent flooding. Also, some sites affected by the 1993 floods in the Midwest and the Great Plains had soil saturation up to 90 days prior to flooding. Consequently, the factors of soil saturation prior to flooding and continuous versus intermittent flooding must be considered when predicting the relative flood tolerance of species.

With the exception of the tolerance ratings for hackberry, green ash, and shingle oak, Table 1 is more conservative in its tolerance ratings than Table 2. Table 1 includes more species than Table 2 and is based on a summary of studies from a broader geographical area. Consequently, *Table 1 is recommended as the field guide" for foresters and other resource managers who are evaluating flood- damaged trees in the Midwest and the Great Plains.*

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FLOODING and its effects on TREES

Insect and Disease Concerns of Flood Stressed Trees

Natural forests in floodplains have evolved to handle periodic flooding and, therefore, many trees in the flooded areas will indeed survive. However, the 1993 flooding has been prolonged and has occurred during the growing season, adding severe stress. The flooding has included not only areas forested by well adapted swamp hardwoods, but has also flooded many urban areas forested by trees that are not well adapted to flooding. In addition, many of the forests now flooded are located behind broken dikes. These forests developed after the dikes were installed in the 1950's and have not previously been flooded, did not evolve to handle periodic flooding and have a different species composition than typical bottomland floodplain forests. These forests, along with urban trees, could be highly susceptible to additional tree mortality from insect and disease attacks due to their weakened state.

Trees that survive flooding are in varying stages of health or vigor. Vigor is influenced by stress. Prolonged flooding is a major stress, especially during the growing season. Low vigor trees often die quickly from a combination of physical injury and rapid invasion from insects or diseases. High vigor trees may recover very quickly and could be healthy as early as the next growing season. Many trees are somewhere in the middle, struggling to survive and slowly trying to regain a higher level of vigor. Until trees regain an adequate level of vigor, they are susceptible to attack by insects and/or diseases. If an insect or disease is successful in invading a tree, the survival of that tree becomes less likely. The battle to regain vigor and ward off attacks from insects and diseases may continue for several years, causing tree death over a period as long as 3-5 years. Which trees become and continue to be stressed will depend on many factors including a species tolerance to flooding, length of inundation, sediment levels, etc. (see Flood Tolerance of Trees section).

Stress Symptoms

Flood stressed trees exhibit a range of symptoms including leaf chlorosis (yellowing), defoliation, reduced leaf size and shoot growth, sprouting, and crown dieback. Early fall coloration and leaf drop often occur. It also is common for stressed trees to produce large seed crops in years following a

stressing event such as flooding. Again, it may not be unusual for symptoms to occur over several years. The symptoms may progress and eventually lead to tree death or they may subside indicating the tree has recovered.

A critical factor in determining the survival of flood stressed trees is whether they become invaded by insects and/or diseases. Flood stressed trees are prime targets for attack by "secondary organisms." Secondary organisms include a wide variety of opportunistic fungi and insects that selectively invade hosts only after they are weakened or predisposed by stress. It is believed that predisposing stresses such as flooding, drought, and defoliation impair host resistance mechanisms, and trigger biochemical responses which release carbohydrates, glucose, and other nutrients which stimulate secondary insects and diseases.

Further, certain root and collar rot diseases are favored by waterlogged, oxygen-deficient soil conditions, most notably those caused by the water mold fungi, *Phytophthora* spp. and *Pythium* spp.. Flooded soil conditions not only promote reproduction and dispersal of these fungi but also promote the susceptibility of plant roots to infection.

Finally, the wood of trees that have died as a result of the flooding will also be quickly attacked and utilized by wood boring insects and blue staining and decay fungi. Where landowners wish to salvage and sell dead or severely declining trees, they will need to be aware of the decline in wood quality that can occur quickly from insect and disease attack. This can significantly reduce the value of wood products. (See discussion of salvage considerations in Management Implications section).

The following is a list of insects and diseases to watch for:

Insects

Stem boring insects are the major group of "secondary" insects of concern. The most common stem borers are beetles, either adults or immatures (larvae) depending on the species. Other stem borers, which may cause problems on trees, will be a few moth or woodwasp larvae. Stem boring insects can be further divided into **phloem borers** and **wood borers**. **Phloem borers** include bark beetles and many of the metallic wood-boring beetles. They are serious pests because the damage they cause occurs in the phloem and outer sapwood layers. These two layers are important in food and water transport and if significantly damaged, trees are severely altered. **Wood borers** may spend some time in the phloem layer, but generally tunnel and

feed within the wood of tree stems or branches. This tunneling is often not a serious impediment to tree survival though it can significantly reduce the "quality" of any eventual wood products. A major concern with **wood borers** is weakening of stems, which may lead to breakage during ice, wind, or snow storms.

Symptoms of stem borers may include small holes in the bark. Entrance holes may have pitch, sap, or sawdust exuding from them. Exit holes are generally very clean and may be round, oval or D-shaped. Removal of the bark should expose larval tunneling. (Bark removal is an additional wound and should only be done on trees already dead or those which are not of high value).

Special management practices for stem borers: 1) Prevent additional wounding or root damage to trees. Wounds create stress and act as attractants to many insects. 2) Sanitize areas by removing and destroying large broken limbs and dead trees. This material may act as breeding sites for stem-boring insects which may later infest surrounding live trees. 3) Increase tree vigor through light fertilization treatments and watering if soil conditions become excessively dry. (This may be required for 2-3 years). 4) Insecticides rarely help; they should **only** be used for high value trees and following the recommendation of a professional entomologist, arborist or forester. Stem borer insecticides are applied to the tree bark as a protectant; therefore, application must be made prior to infestation.

It is unknown if leaf-feeding (caterpillars) or sucking insects (scales and aphids) will become more of a problem following flooding. Plant stress can alter the biochemistry of trees making nutrients and sugars more available to insects feeding on leaves or sap. This could increase survival of these insects and increase their population size. Outbreaks of caterpillars or scales and aphids could further increase stress levels on trees severely weakened by the flood. Therefore, control of these insects should be a priority on high value trees for the next 1-3 years. This may require insecticide application (s). Insecticide recommendations should follow label guidelines.

There are too many tree species and associated insects involved to make an individualized list of potential insect pests. **The following trees, however, are notorious for attacks by insects following stressful periods and often require close watch: all pines, oaks, hybrid poplars, birches (especially ornamental white birches), and hickories.** Also, resource managers should be especially aware of pine bark beetles, *Ips* spp.; twolined chestnut borer, *Agrilus bilineatus*, attacking oaks; bronze birch borer, *Agrilus anxius*; and hickory bark beetle, *Scolytus quadrispinosus*.

Diseases

Armillaria Root Disease

This disease, also called shoestring root rot, can attack hundreds of species of forest, shade, and ornamental trees and shrubs. Although some *Armillaria* species are aggressive pathogens, others are opportunistic and work singly or in conjunction with other secondary action pests. In the Northeast for example, oak trees weakened by stress are often attacked by both *Armillaria* root rot and the two-lined chestnut borer. *Armillaria* root rot is commonly associated with drought-stressed trees, an association that is well documented by research. Excess soil moisture may be as stressful as drought to trees because it can cause "physiological drought" by interfering with water uptake in oxygen-deprived roots. Excess soil moisture and increased severity of *Armillaria* root rot have been observed in oak and chestnut species in Germany and Austria (Bazzigher 1956), in larch in Japan (Kawada et al. 1962), and in rubber trees in Nigeria (Fox 1964).

Symptoms and Management

Diagnostic symptoms include white colored mycelial fans under the bark, shoestring-like rhizomorphs, and "honey" mushrooms which are present only in the late summer or fall. Nonspecific symptoms include leaf chlorosis and defoliation, reduced leaf size and shoot growth, crown dieback, and death. (Refer to the enclosed USFS Forest Insect and Disease Leaflet entitled *Armillaria* Root Disease for color photographs of symptoms and information on management practices).

Canker Diseases

A wide range of fungi incite canker diseases in both hardwood and conifer hosts by invading the bark, cambium, and outer sapwood of branches and stems weakened by mechanical injuries, insect feeding, water extremes, or other diseases. Branches and main trunks of trees submerged in flood waters or injured by floating debris will be prime targets for invasion by canker fungi. Some of the most common canker diseases include *Nectria*, *Cytospora*, *Botryosphaeria*, and *Botryodiplodia*.

Symptoms

Cankers appear as localized dead areas on branches or stems and are commonly associated with wounds or dead branch stubs. They often appear discolored or sunken, and the bark may or may not remain attached to the face of the canker. Some canker diseases such as *Nectria* produce zonate or target-like cankers in response to successive layers of callus tissue forming

at the progressing edge of the canker. Cankers can girdle branches or small stems and result in wilting or dieback. Canker diseases are rarely fatal to their hosts unless large or multiple cankers girdle the main stem.

Management

Because wounding and predisposition play a role in the development of canker diseases, the best approach to management is to minimize tree stress and injuries. See Management of Flood Stressed Trees below for more information.

Phytophthora and Pythium Root Diseases

Phytophthora spp. and *Pythium* spp., commonly known as water mold fungi, are ideally suited for waterlogged soil conditions. Plant roots stressed by reduced oxygen in waterlogged soils exude more amino acids and ethanol which attract infective spores to root surfaces. Infective spores are dispersed in surface water such as flood, runoff and irrigation waters. Survival rates of these spores in water has not been widely studied; however, one study demonstrated that spores of *Pythium aphanidermatum* survived for 185 days after submersion in pond water (Stolzy 1984). This suggests that other species of water mold fungi may have similar survival rates in water. If this is true, an increase can be expected in root and collar rot diseases caused by species of *Phytophthora* and *Pythium*.

Symptoms of *Phytophthora* and *Pythium* Root Diseases

Symptoms include stunting, leaf chlorosis, reduced leaf size, basal stem cankers which often ooze sap, root and collar decay, crown dieback and death. *Pythium* spp. cause damping off and root rot disease on young seedlings in nurseries and can infect nearly all conifers and hardwoods. *Phytophthora* spp. incite root and collar rot diseases on a wide range of nursery and forest tree hosts including:

- **Fruit and nut trees**

- apple, cherry, citrus, and walnut.

- **Shade and forest trees**

- American and European beech; sweet birch; flowering dogwood; fir; sweetgum; horse chestnut; black, Norway, red, silver, sugar and sycamore maples; pin, and red oaks; pines; yellow-poplar and weeping willow.

- **Ornamental shrubs**

- azalea and rhododendron.

Management of *Phytophthora* and *Pythium* Root Diseases

Management strategies for these two diseases must be targeted at nursery operations since little can be done to control these diseases after trees are outplanted. Nursery management practices include:

1. Avoiding planting tree species highly susceptible to *Phytophthora* spp. in poorly drained fields.
2. Improving soil drainage in poorly drained fields.
3. Employing alternative cropping regimes in fields with a previous history of root rot disease. Consider bare fallow for 1 to 2 years to reduce disease inoculum.
4. Using chemical fumigation.

Outplanted trees exhibiting symptoms of root disease may benefit from efforts to enhance tree vigor. (See *Management of Flood Stressed Trees* below for more information).

Management of Flood Stressed Trees

Urban and Landscape Sites

The best approach to managing flood stressed trees is to enhance tree vigor by proper tree maintenance and protection from additional stresses. Tree vigor can be enhanced by fertilizing with a low nitrogen fertilizer, aerating the soil, mulching, and watering if soil conditions become excessively dry. Dead or severely cankered branches should be removed. Prune only when bark surfaces are dry or during the dormant season.

Newly transplanted or mature, high value trees may need protection from leafspot diseases such as anthracnose and from insect defoliators and various sucking insects such as aphids or scales. It should be noted that leafspot diseases are not severe every year. Trees need protection during spring seasons that have frequent rainfall at budbreak and during leaf expansion. Refer to the enclosed USDA Forest Service brochure entitled, *How To Identify and Control Dogwood Anthracnose*, for more information. Although the above mentioned publication deals specifically with dogwood anthracnose, the cultural control recommendations are applicable for leafspot diseases of trees and shrubs in general. A fungicide not mentioned, thiophanate methyl, is labeled for control of anthracnose on shade trees and woody ornamentals. Several tradenames of fungicides that contain thiophante methyl include Cleary 3336, Topsin M, Domain, Fungo and Zyban.¹ Fungicides should be used only to supplement a cultural control program. Read fungicide labels carefully to determine registered uses and application rates.

Forest Stands

Any harvest or salvage activities should create a minimum of damage to remaining or regenerating trees or disturbance to the site itself. Soil compaction, rutting, bark removal,

and branch breakage can all act as additional stress on other trees in the stand.

Salvage activities such as "sanitation cuts" can be beneficial by removing breeding material of stem boring insects. (See Management Implications section for additional salvage considerations).

Insecticide use is rarely practical or ecologically sound in forested situations.

Hazard Evaluation of Flood Damaged Trees

As noted above, flooding results in some trees being stressed, physically damaged, and/or insect and disease infested. These trees possess defects that decrease their structural integrity, making them more prone to windthrow and structural failure. Defective trees located in high use areas such as yards, parks, or other recreational areas are hazardous and pose safety risks to people and property. (The Minnesota Department of Natural Resources, in cooperation with USDA Forest Service, has written a manual entitled, *How To Detect, Assess and Correct Hazard Trees In Recreational Areas*. Copies are available from: Minnesota DNR, 500 Lafayette Rd., St. Paul, MN 55155-4049, price: \$6.00).

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Stolzy, L.H. and Sojka, R.E. 1984. [Effects of flooding on plant disease.] In: Kozlowski, T. T., ed. Flooding and plant growth. Academic Press, New York. 356 p.

Recommended Books

Insects of Eastern Forests, USDA-Forest Service, Miscellaneous Publication 1426, 1985, 608 pages. (excellent reference for insect biology).

Diseases of Trees and Shrubs, WA. Sinclair, H.H. Lyon, and WT.Johnson authors,

Cornell University Press, Ithaca, NY;, 1987, 574 pages. (Excellent color pictures, very comprehensive).

Insects That Feed on Thees and Shrubs, W.T. Johnson and H.H. Lyon authors, Cornell University Press, Ithaca, NY; 1988, 556 pages. (Excellent color pictures, very comprehensive).

How to Detect, Assess and Correct Hazard Trees in Recreational Areas, Minnesota Department of Natural Resources, 68 pages.

Insect and Disease Contacts

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FLOODING and its effects on TREES

Management Implications

Flooding in bottomland hardwood sites is an important natural occurrence and provides much of the disturbance needed for regeneration of these ecosystems. What has been unusual about the floods of 1993 is the combination of length of inundation, growing season occurrence, and flooding of urban and non-floodplain forests.

Tree Recovery

Tree recovery following flooding is relative. A logger, urban forester, or wildlife manager (as examples) may view a tree's recovery from vastly different perspectives. For example, the logger who seeks a long, defect-free straight trunk will be discouraged if a few inches of terminal dieback results in vigorous lateral branch growth and subsequent poor form. An urban forester, however, may be concerned about the potential hazard of dead branches. The loss of a mast crop may be considered a serious problem to a wildlife manager, but the logger may see it as a minor one.

Regardless of the perspective used to define tree recovery, trees need to build up food reserves for future stress conditions such as another flood or a drought. However, environmental conditions (prolonged flooding or rapid drying of soil) often limit recovery.

Factors Affecting Management

Natural resource managers should be aware of the following management implications when evaluating the consequences of the *Floods of '93*.

- There will be a significant increase in disturbed sites as a result of siltation and scouring. Normally this would provide an excellent seedbed for many of the pioneer species that occur on bottomland sites. The problem is timing; seeds will not be available again until early next growing season and a percentage of these sites may be lost

to herbaceous competition. In addition, herbaceous plants will replace the woody understory in many forest stands.

- There may be a bumper seed crop in 1994 as a result of the stress induced by the prolonged 1993 inundation.
- The loss of litter and the duff layer may make the soil more susceptible to temperature variances. This may affect seed germination (particularly of non-floodplain species) as well as delaying spring leaf-out.
- There will be mortality across the continuum from mature trees to new regeneration due to the prolonged inundation. Death will probably come slowly to some species over the next 1-4 growing seasons. Consequently, when low vigor trees are harvested, one should not depend on sprout origin material making up much of the stocking in the next stand.
- Opportunities may increase for planting in bottomland sites as a result of severe scouring or siltation of agricultural fields. The only long-term practical solution for some of these sites may be restoration to bottomland hardwood species by planting. (Refer to Tables 1 and 2 in the Flood Tolerance of Trees section of this resource packet when selecting species for planting.)
- Diameter growth of most flood-intolerant species usually is reduced by prolonged flooding of soil during the growing season. Sometimes the reduced growth occurs so long after flooding that other causes are sought. In contrast, flood tolerant trees may make a spurt of diameter growth during the first year of flooding. For example, a Mississippi study found that the diameter growth of green ash, which is often categorized as relatively tolerant of flooding, was 80 percent greater than normal when water remained on the ground from spring through August.
- Sometimes it is difficult to make valid estimates of wood production in flooded trees by measuring changes in stem diameter, especially in young trees. For example, short-term flooding of some woody ornamentals increased stem diameter largely because of an increase in bark thickness rather than increased wood production. Forest trees may respond to flooding in a similar manner.

- Reduced height growth of many flooded conifers and hardwood trees has been shown in experiments with potted plants. Additional studies have found that height growth of some flood-tolerant species may be increased by flooding if the water is flowing.
- The shallow root systems of trees growing in poorly aerated (flooded) soils often make them prone to windthrow. Windthrow is a management concern in both urban and forest settings.
- Landowners who are investors" in timberland can deduct a flood-related casualty loss if the value of the loss is 10 percent or more (minus any income from salvage) of their adjusted gross income. Flood victims who plan to reforest their land for timber production are eligible for a 10 percent tax-credit and can amortize 95 percent of the cost over a 7-year period.

Salvage Considerations

Little information is published on how much time is available to salvage dead or declining trees before stain-causing fungi begin to significantly degrade sawlog material. Since much of the flood-induced mortality will probably occur over the next two growing seasons, there may be a one to two-year period to accomplish salvage.

Stain-causing fungi enter first through points of injury such as damaged bark and broken limbs, so if there is no apparent mechanical injury, there may be a little more time before stain develops. Light colored hardwoods (ash and birch, for example) stain faster than dark colored species such as oak and walnut. Cottonwood and silver maple will probably deteriorate the fastest.

Foresters must be prepared to develop "salvage plans" as a part of an overall management plan for flooded forestland. Local sawmills, however, may be unprepared to process the dead and dying timber especially if the supply exceeds mill capacity. Species composition may also pose a problem in the marketplace.

Timber harvesting frequently contributes to increased soil wetness and reduced soil aeration by compacting soils and damming subsurface water flow. High soil moisture also results from the large reduction in transpiration which follows harvesting. These factors can impact residual trees following a large-scale salvage cut.

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FLOODING **and its effects on TREES**

Sources of Technical Assistance

Address and phone number information is provided for state-level forestry offices, forest health protection cooperators, Federal and State Emergency Management Agency offices, and extension offices. Individuals are encouraged to contact these local resources for additional state-specific technical information and guidance for tree and forest-related flood management and recovery.

- **State Forestry Offices**

Forest Health Protection State Cooperators

Federal Emergency Management Agency Offices

State Emergency Management Agency Offices

State Extension Forestry Offices

State Forestry Offices

Illinois

Illinois Department of Conservation
Division of Forest Resources
600 North Grand Avenue West
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Nebraska

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Federal Emergency Management Agency Offices

FEMA - Region V

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FLOODING **and its effects on TREES**

Levee Armoring: Woody Biotechnical Considerations for Strengthening Midwest Levee Systems

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Introduction

- The floods that occurred throughout the Midwest during the summer of 1993 were of historic proportions (Ilanhack, 1994). Because of the duration, velocity and extent of floodwaters, levee failures resulted in extensive damage to agricultural land, rural and urban infrastructures, and human resources (Scott, 1993).

In Missouri, agricultural floodplain areas along the Mississippi, Missouri, Grand, Chariton, Locust, Thompson and Osage rivers were particularly impacted. According to the State Emergency Management Agency, about 3.1 million acres of Missouri land flooded. The Food and Agricultural Policy Research Institute estimated crop losses on this land at \$247 million. The USDA Soil Conservation Service (SCS) predicts that reclaiming cropland damaged by flooding will exceed \$600 million (Soil Conservation Service, 1993).

Secondary levees associated with major rivers and upstream tributary levee systems in Missouri experienced an estimated 2019 levee breaks (Soil Conservation Service, 1993) during the 1993 floods. A number of non-scientific surveys conducted by Missouri Department of Conservation and SCS personnel

after the flooding indicate that levees with forested buffer zones or with woody vegetation cover on the levees may have saved many levees from damage and reduced the severity of damage to others.

The beneficial effects of woody vegetation is not surprising considering the increasing use and successful applications of woody vegetative materials in stabilizing slopes and reinforcing soils (Gray and Leiser, 1992; Soil Conservation Service, 1992). In light of these recent observations and uses, this paper examines the potential woody interactions with levee systems and presents some levee armoring designs.

Woody Plant Interactions With Levee Systems

- Woody corridor development and woody levee cover appear to be critical elements in increasing levee integrity (Shields and Gray, 1993).

An informal aerial review of a segment of the Missouri main-stem levee showed a dramatic increase in levee failure (Table 1) as woody corridor width decreased. Observations from Missouri Department of Conservation personnel (Young, 1994) contend that tree screens are credited with saving levees as well as floodplain fields from flood scour. Field reviews completed in February 1994 by the authors (unpublished) on a portion of Shoal Creek in Caldwell county revealed only a single levee break (internal tile line failure) with woody cover and woody corridors of 20 to 100 meters in width. Levees, with woody corridors completely absent and in grass sod, upstream from the wooded corridor site experienced multiple breaks in a similar length of levee.

O.S. Scheifele, an early advocate of woody vegetation for protection of streambanks and levees, made similar observations following the flood of June, 1927 near Memphis, Tennessee (Scheifele, 1928).

"

- It was interesting to inspect various sections of the levees after the big flood. Wherever a heavy stand of native willows or other forest trees were growing in the burrow (sic) pits and on the land between the river the erosion from wave action and current was very slight and on miles of levee where tree growth existed no injury was caused whatever. On the contrary, where land was cleared and there were no obstructions to break the waves, injury and destruction were evident along the entire distance."

The relationship of woody plants and levee integrity may be the result of woody plant effects on altered river hydraulic conditions and biomechanical interactions

of woody root systems and earthen levee material.

Hydraulic Considerations

- For many years engineers have used Manning's equation (Chow, 1959) to describe steady uniform flow in an open channel where:

$$V = 1.49 RA^{(2/3)} SA^{(1/2)} / n \text{ and}$$

- V = the mean velocity of flow in feet per second
- R = the hydraulic radius of the channel in feet
- S = the slope of the energy grade line in feet per foot
- n = the coefficient of roughness

The hydraulic radius is dependent on the geometry of the channel cross section; the slope of the energy line is essentially the average slope of the channel bottom; and the coefficient of roughness is a measure of the roughness of the channel boundary. With all other variables held constant, the greater the roughness, the slower the velocity of flow. The roughness coefficient is dependent on many factors but the two most important influences are surface roughness and vegetation.

In natural streams, this coefficient ranges from approximately 0.025 for clean straight channels to 0.150 for floodways with heavy stands of timber and underbrush (Chow, 1959). This range represents a potential six-fold change in velocity as a result of roughness alone. During a flood event, the vegetation in a wooded stream corridor creates drag forces opposing the flow which dissipate energy, and reduce flow velocity (Henderson and Shields, 1984). Flood waters are less likely to cause erosion and scour as energy is dissipated by vegetation. In addition, sediment carried by flood waters will drop out of suspension as velocity is slowed.

Biomechanical Considerations

- Naturally vegetated stream corridors exhibit a level of channel stability that is lost when vegetation is removed. In addition to slowing the velocity of flow, vegetation helps protect streambanks from surface erosion and slope failure. Tall grass and brushy vegetation tend to lay down during a flood event, dissipating energy and providing resistance to scour (Henderson and Shields, 1984). Root fibers, especially woody root fibers, increase the shear strength of the soil (Schiechl, 1980). Roots also create a fibrous mat that resists scour of the surrounding soil matrix (Henderson and Shields, 1984). Vegetation further enhances slope stability by transpiring moisture from the root zone to the atmosphere (Gray and Leiser,

1982).

Woody material associated with levee systems raise a number of engineering concerns (Shields and Gray, 1993). Hynson et al. (1985) list three potential problems posed by trees on levees. First, they suspect that seepage could occur if tree roots penetrate into embankment areas that have high pore pressures during flooding. Second, windthrow could lead to slope stability or seepage failure. Third, trees can hinder inspection and flood fighting if lower limbs are not periodically pruned. Hynson et al. (1985), however, did not document any failures that actually occurred by these mechanisms. Shields and Gray (1993) note that root-induced piping has not been documented scientifically. Windthrow is a valid concern for isolated or widely scattered trees but is less likely for dense uniform stands and not a concern for small trees and shrub growth forms. Access for inspection and flood fighting may be safeguarded by designs that permit travel access on levees.

Levee Armoring Designs

- Based on hydraulic and biomechanical considerations, we believe maximum levee protection should incorporate both woody corridors and levee woody plantings. Four designs using combinations of woody materials are suggested for trial use and study on Midwest levee systems. All the following designs would be incorporated with a river side woody corridor of appropriate width.

It is important to note that the use of woody material on levees is not an accepted policy by any federal agency at this time.

Levee Shrub and Grass SyStem

- **Design**

The first design uses woody shrub material on the river side of the levee from the toe to the levee crest (Figure 1). A number of native shrub species are suitable for establishment and use (Table 2) with this system. To reduce the chance of insect and disease problems and to increase site diversity, a minimum of three species is recommended. Growth forms and site requirements of the selected shrubs should be compatible. The crest and field side levee slopes would be vegetated with grass sod.

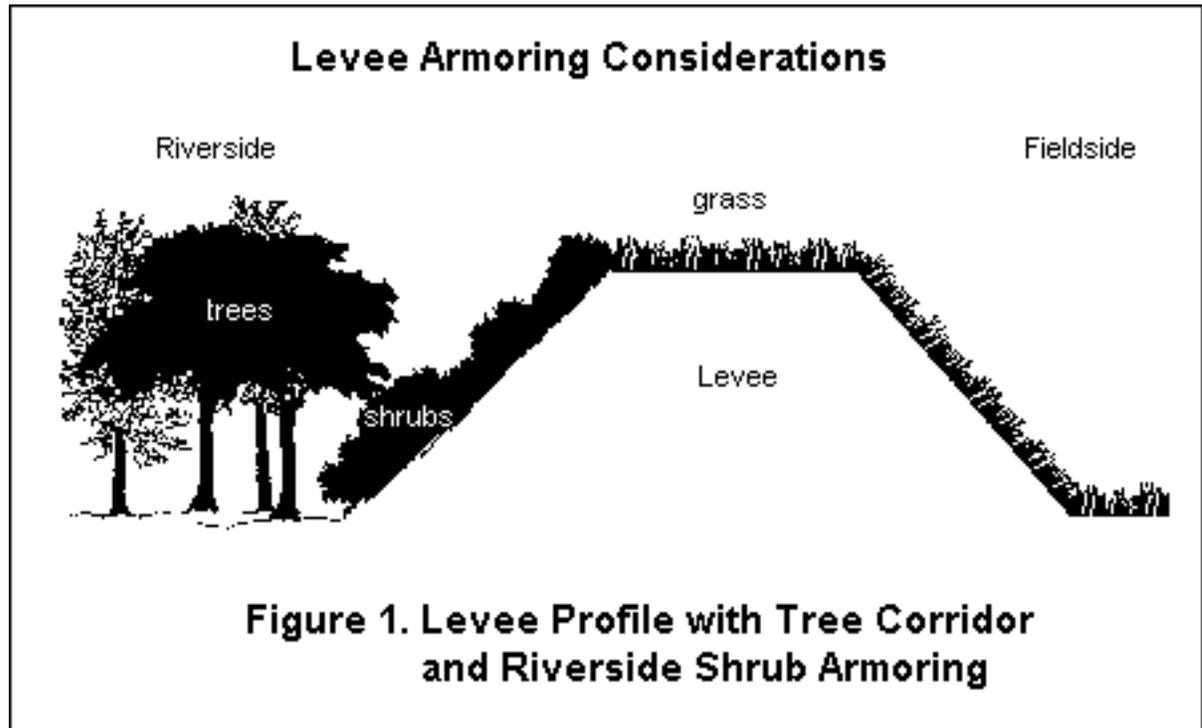
Management

A periodic cycle of cutting (5-7 years) would be the only needed woody maintenance. This will allow the shrub regrowth to maintain a vigorous and healthy vegetative condition and allow improved inspection. For the sod areas on the levee, the use of current U.S. Army Corps of Engineers maintenance guidelines

(1982) would be continued.

Advantages and Disadvantages

This design scenario would aid river side slope stability and protect the levee against wave wash. Habitat diversity would be increased by the addition of a shrub component. Free access to the top and field side of the levee would be maintained for any necessary high water inspections and operations.



Levee Shrub System

- **Design**

The second design uses woody shrub material on both sides of the levee (Figure 2). Choice and selection of shrub species would be similar to design 1. The top of the levee would be maintained in a grass sod.

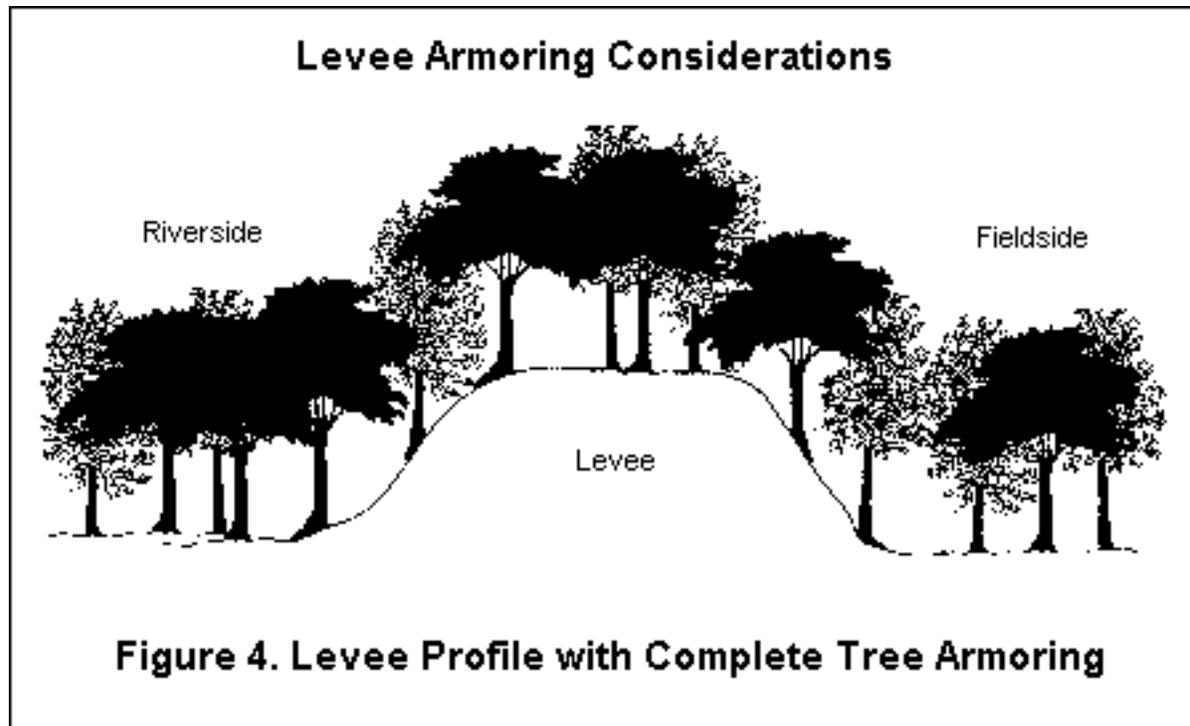
Management

Woody shrub management would be similar to design 1. To maintain adequate protection for the levee, cutting shrubs for rejuvenation should be avoided on both sides of the levee within the same segment. Annual mowing of the top of the levee would be needed to maintain sod cover and prevent woody encroachment.

Advantages and Disadvantages

The advantages and disadvantages would be similar to design 1 with increased acreages of diversified habitat and added field side slope protection. Visual

very limited access to entire levee system.



Summary

- Historically, flood protection measures in the Midwest have ignored and actively excluded woody vegetation from levee systems. In light of recent reviews of levees in Missouri, the attitude that woody vegetation is undesirable and negatively affects the maintenance and stability of the levee structures may be unjustified and an unwarranted position.

Instead of excluding woody vegetation, levee designs should actively incorporate woody materials as corridor plantings between the levee and river and as protective cover on the structure itself as long as inspection and flood fighting capabilities are maintained.

Levee armoring with properly designed woody material will slow floodwater velocities, dissipate energy, reduce scouring potential, and increase soil shear strengths. These hydraulic changes and biomechanical attributes would increase levee protection and stability, improve wildlife habitat diversity, establish natural riparian ecosystems, reduce maintenance costs, reduce flood damage to floodplain fields by trapping sediment and debris, and provide an opportunity for secondary wood products to be harvested.

Field studies and research are needed to evaluate the full potential of levee

armoring designs and reduce the negative aspects such as reduced access and inspection capabilities.

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FLOODING **and its effects on TREES**

Forestry Strategies To Protect Floodplain Agricultural Systems

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Introduction

Damages to agricultural lands and associated infrastructure from the record floods of 1993 in Missouri were staggering. Floodplain croplands, some of the most valuable and productive in the state, were impacted by debris accumulation, sediment deposition and scour erosion. Cropland damaged by sand and scour for just the Missouri portion of the Missouri River was estimated at 455,000 acres, with an estimated \$500 million to reclaim sand damaged land (Soil Conservation Service, 1993). Additional millions of dollars will be required to rebuild levee breaks and restore fertility to flood-damaged cropland. In some instances costs for recovering the land exceeded its market value as cropland.

Questions were raised about the future crop production capabilities of the damaged land. Programs activated to assist with the clean-up and repair of damaged farmlands in the floodplains and the associated agricultural infrastructure were designed to make repairs to restore pre-flood conditions. Mixed with the damages were some excellent examples of floodplain use and management that could serve to guide changes in the way floodplain agriculture is conducted to avoid or minimize future severe flood damages. The strategic use of trees in floodplain agriculture is the key to accomplishing the desired changes and realizing the benefits.

Role of Trees In Floodplains

Historically, trees performed some important functions and their presence in the river bottomlands significantly influenced the floodplain landscapes farmed today. Woody vegetation stabilized the soil and controlled scour erosion. Stands of trees absorbed the energy from floodwaters and caused the deposition of water borne sediments. Floodplain forests stored the overflow waters and drove many of the processes to support aquatic life systems and improve water quality.

Following the 1993 floods it was apparent that there were not enough trees in the floodplain. Extensive damages to floodplain cropland and the associated agricultural infrastructure were preventable with the strategic placement of trees and with more effective management of opportunities offered by natural stands. Major forms of damage that can be addressed by manipulation of tree resources are debris accumulation, scour erosion, and sand deposition. Also, woody vegetation appears to be under-utilized and discriminated against as a biological system of levee protection.

Brumfield (1993) described the influence of strategic cottonwood plantings on debris trapping and sand deposition in the Thompson Bend high flow channel of the Mississippi River in Mississippi County Missouri. Satterlund (1972) discussed the use of Manning's equation in hydraulics to express velocity. There is a ten-fold increase in the roughness coefficient factor of Manning's equation between flow over a packed clay surface and a surface composed of dense shrubs and forest litter. Woody vegetation on floodplains causes significant reductions in flow velocity causing the deposition of suspended particles and trapping debris.

Scour erosion is controlled by the dense mat of intertwined, fibrous roots that reinforce the top foot of soil in the forest floor. Perry (1989) reported that trees develop root systems that extend horizontal distances of up to 2 times tree height. Any one square foot of soil on the forest floor will contain the intermingled roots of 7 or 8 different trees.

During flood events, levee systems frequently function as stream banks. Shields and Gray (1993) reported positive effects of woody vegetation on levees in California supporting observations in Missouri during and after the 1993 floods that trees could be excellent levee protection.

Levee Maintenance

Scheifele (1928) installed and documented the effectiveness of numerous levee and streambank protection plantings utilizing woody vegetation, many in the Midwest. He also discussed the concerns of engineers about woody vegetation on constructed embankments.

Three major concerns are the basis for levee maintenance standards that specify that no woody vegetation be allowed on levee embankments.

1. Large trees will windthrow from saturated levees, removing a large soil mass and creating a breach point in the levee.
2. Large tree roots will extend through the levee and cause piping during floods. This is primarily a concern when large old trees die.
3. Woody vegetation attracts burrowing wild animals to the levee embankment and their activities create breach points in the levee.

These concerns must be addressed and their validity documented or disproved before recommendations to armor levees with woody vegetation can be successfully advanced. Bottomland hardwood ecosystems in the floodplains of Midwestern streams have been converted to agri~ecosystems. These converted systems lack stability and are more susceptible to environmental damage (Bratton, 1993). Restoring trees to these systems can add stability, increase diversity and supplement the agriculture systems that will continue to occur on floodplains.

Agroforestry Systems

Trees that work for agriculture are called agroforestry systems (U.S. Forest Service, undated). Some agroforestry systems with specific application to floodplains include windbreaks to stabilize sandy soils, filter strips and riparian areas for bank stabilization and water quality, alley cropping for enhanced crop production and protection, wildlife habitat, woodlots and fuelwood plantations. Agroforestry systems are installed for several objectives including profit, productivity enhancement, energy conservation, natural resource conservation, environmental diversification and modification and to enhance the environment for people.

Hershey and Wallace, (1993) found that waterbreaks of trees planted perpendicular to the flow of high energy flood waters were economical based solely on the reduction of damages to crops, assuming floods of 10 year frequency. Tree species adapted to the floodplains include species valued for their lumber, and pecan, valued for the nut crop. Agroforestry systems designed specifically for the floodplain are needed to develop and analyze all of the possible alternatives of maintaining productive agriculture while increasing environmental stability and protecting the agricultural infrastructure of the floodplains.

Floodplain Agroforestry Systems

The system designed for Thompson Bend is an example of the potential benefits of this system. The Thompson Bend plantings trapped debris so efficiently that mountains of debris rode the trees down, submerging their tops in the 1993 floodwaters and killing sections of the plantings. However, the tree rows still functioned to hold the debris and deposit sand within the confines of the dead tree rows and leaving the crop land clear and unscoured for 1994 planting.

Conclusions

Agriculture will always have a role in the fertile floodplains of Midwest streams. Agroforestry systems are one means of creating a stable balance between human needs and natural forces.

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FLOODING **and its effects on TREES**

Tree Planting Enterprises on Flood-Damaged Farmland

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Introduction

In the aftermath of the Great Flood of 1993 eight Midwestern States lost agricultural crops valued at \$1.4 billion on six million acres. Missouri was especially affected because 498 miles of the Missouri and 487 miles of the Mississippi Rivers flow through or adjacent to the State boundary.

Floodwater damage to agriculture land in the floodplains of the Missouri River left behind a landscape scoured by erosion and inundated with sand deposits. In Missouri, the Soil Conservation Service estimates the flood left 60 percent (455,171 acres) of the previously cropped Missouri River floodplain covered by sand. Over 91,000 acres had sand deposits which averaged 24 inches in depth: At this time accurate information is still not available on how many acres were so severely damaged that traditional reclamation is not physically nor economically feasible.

However, it is safe to say that many landowners and even communities are looking at the social, environmental, and economical aspects of new alternative uses for the floodplain and its river corridor.

Purpose

Today, I would like to talk with you about tree plantings as an enterprise, but not in the sense that this is an economic activity, but from the standpoint of a daring new initiative.

Forest researchers in the early to mid-seventies (Dutrow et. al 1970; Porterfield 1975) conducted economic evaluations of short rotation woody crop systems. These studies concluded that while fast-grown tree plantings are economically viable, they still can not financially compete with soybean production. A recent study was commissioned by the Environmental Protection Agency and conducted by the Center for Agriculture and Rural Development at the University of Missouri. The purpose of this study was to perform an economic analysis of various alternative floodplain management scenarios. This study concluded that although short rotation woody crop systems (hybrid poplars) and herbaceous energy crops (such as switchgrass) had positive net present worths they could not compete with corn, soybeans, and wheat.

One of the shortcomings of this study was the failure to include the high costs of levee repair into the costs of crop production. Such exclusions beg the question: What social costs are people expected to pay for crop production in the floodplain? Another problem which exists is the paucity of data on yield and production costs for switchgrass and hybrid poplar production in the Midwest, especially on deep sands.

However, the authors of this study do conclude that there is evidence which suggests that short rotation woody crop systems and herbaceous energy crop species can be successfully grown in areas susceptible to flooding. They go on to point out that these crops can provide benefits such as riverbank stabilization and levee protection, but these benefits are not quantified.

Recent studies (Doan and Ranney 1994) from Oak Ridge National Laboratory suggest that "efforts are justified to thoroughly examine overall benefits and costs of planting flood-prone agricultural areas within the Mississippi River valley to energy crops to reduce damages and costs related to flooding. In the interim, the facts are these: the levees are repaired, or for the most part, will be repaired, and crop production will continue in the floodplains.

What role can tree plantings play in the restoration and recovery of these dynamic riverine systems? In the near term, the role is not the traditional one of displacing crop production with tree plantations either as short rotation woody crops for fuel energy or even some alternative building material product (i.e. panel board). Farmers do not buy into tree planting as an economic alternative per se because they feel as though they could never exercise a harvest alternative in the future even if they wanted too because of section 404 wetland regulations.

One successful example of a working waterbreak can be seen at Thompson Bend on the Mississippi River in Mississippi County, Missouri. These cottonwood plantings established on former row crop land have demonstrated important functions which have included debris screening, uniform sediment deposition and elimination of scour erosion.

In informal discussions with farmers who farm the floodplains along the Missouri River around Brunswick and McBaine, Missouri, it was learned that they feel as though the tree buffer can play a role in protecting the floodplains. Some farmers would hope that the narrow tree buffer along the Missouri River could be widened.

Economic Benefits

I have identified four economic benefits "savings" from planting trees between the mainstem levee and the river bank:

1. There will be a reduction in levee failure. I am not saying that levees will not be breached during floods. What I am saying is that levees will not be destroyed, although there may be some topwash and sidewash. Trees planted in a wide enough corridor on the inside of the levee in areas of high energy such as a bend in the river (where past experience has shown levee failure) can reduce the flow rate and dissipate water energy.

The Corps estimates the current cost of new levee construction at \$240,000 per mile. This cost includes the cost of fill material, seeding, mulching, drainage, rock surface, standard scraping and maintenance. In the area of Saline County, Missouri, this cost represents an average of \$400.00 per acre.

2. There will be a reduction and elimination of sand deposition on tillable ground behind the levee. In places along the river between Brunswick, Missouri, and McBaine, Missouri, there can be seen depositions of sand within the tree line along the riverbank which is actually higher than the man-made levee. The cost of sand removal is estimated at \$1,100 per acre. However, I suspect this is an optimistic estimate.
3. There will be a reduction in the government funds expended for corn price supports. Assuming a target price of \$2.75 per bushel, and an average projected farm or market price of \$2.25 per bushel, then the deficiency payment is $\$2.75 - \$2.25 = \$0.50$ per bushel. Furthermore, assuming an established corn yield of 100 bushels per acre, then the payment is \$50.00 per acre (100 bushels per acre x \$0.50 per bushel deficiency payment).
4. There are soil erosion control benefits arising from timber production. Findings from a recent study (Oweg, 1994) have shown that the average present value of social benefits per acre obtained through the conversion of erodible agricultural lands in Mississippi to pine plantations was a positive \$138.94 at a 4% real discount rate. For lands in the floodplain we simply do not know what the actual savings from soil erosion reduction would be as a result of tree plantings.

Future Research

I will conclude my presentation by telling you about a research project which we have initiated along the Missouri River within the Eagle Bluff Wildlife Area. This 3,636-acre tract just southwest of Columbia, Missouri, is designed to be the largest cooperative project in the nation utilizing treated wastewater effluent for wetland management.

The area selected for the tree plantings lies approximately 400 feet east of the Missouri River bank and adjacent to a 3,000-foot break in the main levee. The purposes of this project are to determine if specially selected fast-growing tree species can be successfully established and grown in deep sand deposits. A longer term goal is to monitor changes in the development of the organic layer and chemical properties of the soil.

Tree species chosen for study will include; native pecan (*Carya illinoensis*, Wangenh.), sycamore (*Platanus occidentalis* L.), eastern cottonwood (*Populus deltoides* Bartr. ex Marsh. var. *deltoides*), river birch (*Betula nigra* L.), and silver maple (*Acer saccharinum* L.). Each species will be replicated in three plots in each block, and each species will be randomly assigned to a plot. Each plot is 72.0 by 90.0 feet and will contain 50 trees of each species planted on an 8.0- by 10.0-foot spacing. In addition to the five species, a control treatment will be assigned to each randomized complete block. In the control treatment the natural recruitment of trees and other woody vegetation will be monitored, and no artificial planting will be done.

In each plot individual tree survival will be monitored and mortality will be determined. In addition, the diameter and height of individual trees will be measured and recorded. Also, cost and production data will be recorded for all tree planting establishment and early culturing activities. Individual-tree growth and yield data will be analyzed using analysis of variance statistical methods.

At the research site rainfall will be monitored and recorded using a Tipping Bucket Rain Gauge and electronic Event Recorder. At the ends of each plot a plastic pipe will be installed in the soil. Soil moisture will be recorded at different depths using Time Domain Reflectometry. These climatic and edaphic factors will be used to study the relationship between depth of soil moisture and tree survival.

I perceive the role of tree plantings to be an insurance policy taken out to protect valuable resources between the main levee and the river bank.

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