

# DEVELOPING AN URBAN FOREST MANAGEMENT PLAN FOR HURRICANE-PRONE COMMUNITIES



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## Introduction

This chapter brings together the information and tools from previous chapters and changes the focus to the community rather than the homeowner, and from individual trees to the urban forest. The urban forest is the collective sum of all trees and vegetation in and around an urban area. Urban forests are an integral part of a community's well-being, so a management plan for its urban forest is essential to a community. An urban forest management plan should consider public and private trees as part of the urban ecosystem. An urban forest management plan does not allow a community to tell each individual or homeowner how to manage their property, but it does allow a community to take trees on private property into account so that planners can look at the entire forest as a resource to manage.

Communities (e.g. neighborhoods, homeowner associations, towns, or cities) can manage their tree resources to meet common goals using a management plan. By working together rather than as individuals, communities can maintain or enhance their urban forests and improve their

well-being. This chapter along with preceding chapters can be used as a guide for citizen and tree care professional participation in managing the community's urban forest and for community leaders in developing a plan for their urban forest.

The process outlined in this chapter is dynamic and adaptable and can be used by any community, regardless of type or size. All the components of this process are related and are part of the overall objective of achieving a healthy, wind-resistant urban forest. A healthy urban forest is composed of trees that maximize ecosystem benefits and withstand natural and anthropogenic stresses and disturbances, such as wind from hurricanes and tropical storms, flooding, pollution, etc. Several urban forest management and street tree master plans were reviewed in preparation of this chapter. Additionally, conversations with urban foresters from across the Southeastern US and elsewhere were used to develop this outline to help a community start its own process.

## Why Develop an Urban Forest Management Plan?

An effective urban forest management plan<sup>1</sup> should be developed and implemented before damage from a windstorm or hurricane occurs. It also can be used as a blue print for post-hurricane response to damages after a storm. Developing a management plan can:

- Create a safe and attractive environment.
- **Maintain or enhance public and private urban forest cover.**
- Provide ways of responding to the community's needs and requests.
- **Maximize the well-being of residents and visitors.**
- Minimize the costs of managing your trees and hazards to life and property.
- **Improve coordination of management activities with other associations, neighborhoods, departments or offices.**
- Establish measurable and long-term goals and objectives.



**Figure 1** The process of developing an urban forest management plan for hurricane-prone communities.

<sup>1</sup> An urban forest management plan outlines day to day management activities, or the who, what, when and how, that need to be accomplished to achieve a community's goals and objectives regarding their public and private trees. This is different from a street tree master plan, which involves specific goals and objectives and management related to public trees along streets and public rights of way (Hubbard 2000).

## How to Develop an Urban Forest Management Plan for Hurricane-Prone Communities?

In general, a community urban forest management plan for hurricane-prone communities needs to be viewed as a process and not a product (Figure 1).

Figure 1 outlines a process that will answer four basic questions using seven general approaches:

### What does the community want from its urban forest?

- Creating a vision (p. 2)
- Setting visions, goals and objectives (p. 3)
- Getting community participation (p. 3)

### What is the community's urban forest resource?

- Assessing the community's tree, fiscal, and human resources (p. 5)

### How can the community achieve the urban forest it wants?

- Developing goals and objectives (p. 4)
- Implementing a plan to meet the goals and objectives (p. 7)

### Is the community achieving the urban forest it wants?

- Monitoring and evaluating (p. 8)

## Creating a Vision

At the beginning of this process, the community should identify a vision for its urban forest to achieve a functional management plan (Figure 1). A vision statement will help define the goals and objectives, which lay the framework for the management plan. A vision is the desired future condition of the urban forest, and it should be concise and meaningful (Hubbard 2000). This vision needs to be created by and accepted by the community. Community consensus is critical in defining what goals are most important because the time and resources available to implement those goals are limited. For example, the vision of the Urban Forest Hurricane Recovery Program might be to promote a healthy and wind-resistant urban forest. It could be aimed at helping citizens and communities to restore an urban forest after storm damage and to set better urban forest management practices so that future storms are less devastating.

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## Setting Visions, Goals and Objectives

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### Goals

Goals are the general statements about what your community is trying to accomplish. Each goal statement then has its own set of objectives. A goal for hurricane-prone communities could be to maintain or increase tree cover, wind resistance, and tree diversity.

### Objectives

Objectives are focused, measurable, result-oriented activities that support the completion of a goal and help the community meet its vision. Some example objectives for a wind-resistant urban forest might be to remove hazardous trees, initiate a pruning program, and plant wind-resistant trees of different ages and sizes in groups in appropriate locations.

Different goals do not have to be exclusive or independent of one another. They often can be linked to achieve multiple benefits. If other goals for a wind-resistant urban forest are to reduce storm water runoff and energy use, specific objectives could be to 1) use porous surfaces in parking lots and 2) plant groups of wind-resistant trees for shade. These combined objectives could result in reduced storm water runoff and increased urban forest cover in your community. So, by selecting species that are wind-resistant and planting them in groups in appropriate areas to reduce storm water runoff, the community increases its tree canopy and shade, improves wind resistance, reduces energy and thereby achieves all three goals (Figure 2). In the following sections we will explain how this publication can be used to help you select some goals and objectives toward creating a more wind-resistant urban forest.

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## Community Participation

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To be effective, the vision statement and well defined goals and objectives should be a community activity (Figure 1). Establish a broad-based community working group or team (Letson, 2001). A meeting facilitator is often needed to ensure that everyone is heard and that all concerns are identified. The group should meet periodically. For example, the working group could consist of:

- Private citizens
- **Community and urban foresters**
- Tree care professionals
- **Parks and recreation, planning, zoning, and extension service representatives**
- Emergency management services
- **Media contacts**
- Public utility providers
- **Engineers**
- Local non-profit organizations, and
- **Other public entities depending on the characteristics of your community**

An example of a working group was the one that helped develop Miami-Dade County's Street Tree Master Plan which establishes the direction for planting and managing trees along streets and highways for beauty and environmental benefits. The group consisted of The Community Image Advisory Board, Department of Environmental Resources Management, Public Works, Planning and Zoning, Cooperative Extension, Office of Strategic Business Management, Parks and Recreation, Office of Emergency Management, among others (Miami-Dade County, 2007).

If the community has not participated in the development of the management plan from its outset, the plan should at least be presented to the community before it is implemented so that residents



Figure 2

Combining different species and surfaces to meet multiple objectives.



and community planners can participate in the decision-making process and, if necessary, help develop alternative management options if initial proposals are not acceptable (Figure 1). Involving the community in the decision-making process will give the management plan a greater chance of acceptance and success:

- The community can help identify and develop alternative management options.
- **The team can discover new information relevant to the community and urban forest.**
- The plan and its actions will demonstrate fairness for all the members of the community.

Some ways of increasing community participation include:

- Discussing the plan with friends and neighbors.
- **Organizing outreach activities such as news releases and public meetings.**
- Developing educational programs for schools and other community groups.
- **Establishing your city as a Tree City USA.**

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## Developing Goals and Objectives

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It is important to narrow down: (1) who will be responsible for implementing the plan; and (2) what and how and when the plan's activities will be carried out (establishing a timeline). The information, lessons, and strategies from previous chapters can be included directly as objectives in your plan. For example:

- An objective to reduce or prevent the number of tree wind failures can use information from *Chapter 6—Urban Design for a Wind Resistant Urban Forest*, which presents appropriate design and plan management strategies. This chapter and *Chapter 5—Lessons Learned from Hurricanes* also present urban design strategies for increased wind resistance, such as planting trees in groups rather than individually and giving trees enough rooting space for their size (Figure 3).
- Specific post-hurricane restoration objectives and activities in your plan can use information from *Chapter 4—Restoring Trees after a Hurricane*, which explains specific tree pruning activities necessary for restoring trees after hurricanes. Also *Chapter 12—Developing a Preventive Pruning Program: Young Trees* and *Chapter 13—Developing a Preventive Pruning Program: Mature Trees* outline preventative pruning programs for young and mature trees. These can be used as multi-year objectives that can reduce damage from future storms for new and existing trees.

- Use of wind-resistant tree species is one objective for achieving a wind-resistant urban forest. *Chapter 8—Selecting Southeastern Coastal Plain Trees Species for Wind Resistance* and *Chapter 9—Selecting Tropical and Subtropical Trees Species for Wind Resistance* list tree species that have been determined to be wind resistant.
- Objectives can also incorporate lessons from past hurricanes. *Chapter 5—Lessons Learned from Hurricanes* for example mentions removing hazard trees before the wind does and being careful not to damage or cut main support roots during construction, since this will damage the tree's anchoring system.
- After Hurricane Andrew, more trees were damaged as a result of hurricane debris clean up (Burban and Andersen 1994). By designating areas for debris storage and temporary housing, communities can avoid causing further damage to their urban forests.
- Additional goals and strategies to reduce your risk from tree damage can include maintaining diversity in your community by planting a mixture of species, ages, and layer tree and shrub canopies (Miller 1997).



Photo courtesy of the National Oceanic and Atmospheric Administration

Figure 3

Aerial view of the effects of a hurricane. Would proper species selection and planting trees in groups have prevented this?

## Developing Goals and Objectives Specific to Your Climate

Among its urban forest master plan objectives, Rochester NY determined to select trees with strong branch structure to minimize ice storm damage, prohibit the planting of ash trees to minimize damage from emerald ash borer, and establish a database to identify and separate street segments covered by Federal Highway Administration reimbursement from those covered by Federal Emergency Management Agency (City of Rochester 2005). Other cities such as Urbana, Illinois have tree emergency response plans that closely follow their snow removal plan (Personal Communication, Mike Brunk, City Arborist).

Using the example from northern cities, hurricane-prone communities could develop emergency management goals as part of their plan (Letson, 2001). The draft urban forest management plan for Pineville, Louisiana, for example, calls for developing "storm plan" objectives to be followed when a storm occurs (City of Pineville, 2006). Although an objective like this might be complex for large metropolitan areas affected by the severe 2004-2005 hurricane season, it might be simple for smaller communities.

The working group needs to determine which goals and objectives are the highest priority and which can be achieved within current fiscal and resource limitations and then develop action items and specific steps necessary to achieve every objective. In fact, most objectives in a management plan need alternative options because of changes in funding, personnel, and community concerns (Figure 1). Objectives can also be presented as alternatives or designed to accommodate several goals and contingencies. For example, three alternative objectives for removing hazard trees in order to achieve the goal of a wind-resistant urban forest are:

### Objective 1

#### Remove all hazard trees at once

This represents an improved efficiency and lower cost since work crews need to visit a neighborhood only once to remove undesirable trees. On the other hand, a significant portion of the canopy would be removed and this might upset residents who value these trees.

### Objective 2

#### Remove hazard trees and wind-prone species as opportunities become available

This gradual change to the canopy might be less disruptive to the community but it will be less efficient and cost more than Objective 1 because crews will need to visit a neighborhood several times to complete the objective before a hurricane affects the community.

### Objective 3

#### Leave hazard trees in place

This objective will prove catastrophically costly and inefficient if a storm strikes, but it may nevertheless be the most appealing to the community if it does not have any resources to allocate to tree removal.

As with most things in life, there will be trade-offs and these need to be assessed by the more specialized members of the working group (e.g. tree care specialists) and reviewed and accepted by the community. If the team and the community review the trade-offs together, there will be a greater chance of finding a compromise or solution acceptable to most of the community.

## Assessing the Community's Tree, Fiscal, and Human Resources

Most communities will need some information to help develop the vision, goals and objectives. Some key questions this information should answer are:

- What should the urban forest look like and provide for the community?
- **How much urban forest do we want and need now and in the future?**
- Why do we want to manage the urban forest?
- **How will we respond in case of a hurricane?**

The information needed for your plan can come from several sources (Letson, 2001). Historical records, lessons learned from past hurricanes, library resources, and other community groups can have tree-related

information needed for developing your plan. *Chapter 4—Restoring Trees after a Hurricane* and *Chapter 5—Lessons Learned from Hurricanes* in this series can be especially useful for this. A systematic inventory of trees in your community is particularly useful for assessing, establishing, and measuring your goals and objectives. Keep in mind that data collection is expensive; measure only what is needed. Chapters 7 through 10 in this series and Miller (1997) will provide you with ideas for selecting appropriate trees including tree species, size, condition, location, growing space, and site history (see <http://orb.at.ufl.edu/FloridaTrees/> for more information).

The working group needs to identify what information is necessary to accomplish the goals and objectives. This will help to identify problems and issues. But once the team has had community input, specialists should begin to lead the process (Figure 1). An urban forester or arborist on the team can determine what data to collect during an inventory to meet management objectives. Remember, there is no right or wrong type of assessment or inventory; this will depend on your community's vision, goals, objectives, and resources.

Information on current or past management practices (e.g., pruning history) and canopy characteristics is also useful for developing your objectives. For example, *Chapter 3—Assessing Hurricane-Damaged Trees and Deciding What to Do* indicates that species suffering high branch loss during hurricanes will need pruning and long-term monitoring. Reviewing current practices (such as tree planting, pruning and removal) and plans (such as street tree management, emergency response plans, ordinances, etc.) can also identify common goals and help to explore ways to integrate efforts (Letson, 2001). The urban forester or arborist in the working group can assess tree risk and pruning programs and prioritize areas for tree removal.

## A Lesson Learned

Hurricane Andrew (Figure 4) revealed that unwise urban forest composition and planting practices resulted in extensive and unnecessary urban forest loss and associated damage to property (Burban and Andersen, 1994). Additionally, in many cases more trees were damaged as a result of hurricane clean up. Trees were used as brace posts to load debris and natural areas, and undamaged trees were bulldozed to make room for debris and temporary housing. Lessons from past experiences such as these can be used to assess the history of your tree resources and provide your community with insights on what is likely to happen after a hurricane (Letson, 2001). Chapters 1 through 3 in this series present tree-related hurricane response activities you might expect after a hurricane; some of these recommendations can be included in your plan as objectives.



Figure 4

Hurricane effects on palms in southern Florida: Hurricane Wilma (top) and Hurricane Andrew (bottom).



## An Ecosystem Approach to Assess Your Urban Forest

The city of Tampa, Florida assessed their entire urban forest ecosystem (public and private trees) rather than just focusing on trees in streets and parks. The information gained through this city-wide assessment of Tampa's urban forest ecosystem will help the community develop a more comprehensive and effective management plan because public and private trees are included in the analysis (Figure 5). This ecosystem approach could also be used as baseline information for monitoring and assessing hurricane effects on trees and to provide information for emergency management agencies. Other cities such as Houston, Texas and Minneapolis, Minnesota have also used this approach for promoting and raising awareness of their urban forest ([www.itreetools.org](http://www.itreetools.org)).



Figure 5

Aerial view of an urban forest ecosystem.

The team needs to assess the resources available—people, funding, and time—to manage the urban forest. Unfortunately, many activities that need to be done to create a wind-resistant urban forest might not be feasible. For example, species listed in *Chapter 8—Selecting Southeastern Coastal Plain Tree Species for Wind Resistance* and *Chapter 9—Selecting Tropical and Subtropical Tree Species for Wind Resistance* might not be available, or initiating preventative pruning programs from *Chapter 12—Developing a Preventive Pruning Program in Your Community: Young Trees* and *Chapter 13—Developing a Preventive Pruning Program in Your Community: Mature Trees* might be limited by budgets. An assessment of your resources will identify what can and cannot be done, thus defining the scope of the plan and its timeline (Figure 1).

Resource assessment is a critical step because it identifies limitations as well as potential avenues to minimize those limitations. For example, if funding is a critical issue, the team may want to apply for an urban community forestry grant to help offset costs. Similarly, if personnel is a critical issue, the team may want to hire a consulting firm specializing in urban forestry to do the inventory and data synthesis. Planners and working group members with fiscal experience can help assess available fiscal and human resources.

The state and private forestry organization of the USDA Forest Service and State Forestry Agencies, in partnership with national and local organizations, provide financial and technical assistance to plan, protect, and manage trees. Most states have urban and community forestry grant programs that can be used to fund tree inventories, management plan development, and other activities. For more information see <http://www.arborday.org/programs/urbanforesters.cfm>.

After assessing your urban forest and community resources, review the management plan's goals and objectives to ensure that they are still relevant in light of the information generated by your assessment or inventory (Figure 1).

## Implementing the Goals and Objectives of the Plan

Once the community has selected objectives, it's time to carry them out to meet the agreed-upon goals.

Implementation is a continuing process in the long-term care of the urban forest, and should not be seen as the "last step" of a finite project (Figure 1). All of the planning and building of consensus up to this point

will help to ensure that the plan runs as smoothly as possible. But you should expect implementation to be an ongoing learning experience, and anticipate the need for contingency planning.

Some objectives can be achieved within a certain timeline, but this process needs to be updated regularly because your community, environment, resources and urban forest will change. Information from Chapters 4 through 13 of this publication series present several strategies that can be incorporated into your plan. In Florida, hurricane-prone areas are experiencing tremendous growth, and many new communities are being created every year. People and trees are constantly undergoing changes, and hurricanes will continue to strike Florida. It is essential for communities to plan as they grow to be in the best shape possible to withstand hurricanes. At this point in the urban forest management plan process, participation of team members representing emergency management services, public utilities, and municipal/county personnel is crucial.

## It's Important to Adapt Your Plan

The city of Plantation, Florida developed its urban forest management plan in 2003. A tree inventory of over 5,000 trees served as the baseline information for developing their goals and objectives (City of Plantation, 2003). However, the 2004-2005 hurricane seasons affected the city's tree cover substantially. As a result, the inventory could no longer provide the information necessary for meeting the goals established in the plan. Rather than continuing with the original plan, the community will adapt their goals and objectives after conducting a new tree inventory. This type of change is inevitable and the ability to adapt is necessary in any hurricane-prone community.

Figure 6  
Monitoring urban trees after and before a hurricane.

## Monitoring and Evaluating the Plan

During the implementation your plan, it will be necessary to establish procedures for monitoring and adapting your plan. A management plan should be viewed as a living document continually changing to reflect changes in resources and funding, and the needs of the community. In most existing urban forest management plans, monitoring is the most neglected step. Yet, it is one of the most critical elements of any plan because it will determine if the plan's goals and objectives are being met.

Monitoring is the collection of information to determine if the plan's goals and objectives are being met – in other words, is your plan effective? When monitoring the objectives and goals of your plan, the working group should ask the question “What are we doing to meet our goals and vision?” It is important to determine what your monitoring indicators or milestones will be. You can observe and collect information on many indicators. For instance, number of tree plantings, increases in tree cover, and number of trees pruned per year (use Chapters 11 through 13 to help you select indicators). Select indicators that are easily measured and repeatable so that the community can measure progress. Avoid collecting too much data and focus instead on the objective's relevancy to your goals. Make your monitoring efforts as explicit and simple as possible, and be sure they are clear to everybody on the team (Figure 6).





Monitoring allows you to evaluate how well your activities are achieving your plan's objectives. Evaluate your monitoring information as a team, learn from other team members and modify or improve goals if necessary (Figure 1). Development of a management plan is a continual process and will not end with the writing of the plan. Monitoring will also provide feedback on how to improve your plan.

## Evaluation May Mean Learning and Changing Your Plan

As part of their urban forestry management plan, the city of Charleston, South Carolina monitored and evaluated its tree maintenance operations. Charleston's urban forestry division's tree maintenance activities were compared to those of six other municipal forestry departments from other parts of the United States to determine how effectively the Charleston division was fulfilling its objectives (City of Charleston, 2000). Although Charleston was highly responsive to its citizens, it did not have a proactive pruning program. Initiating a proactive pruning program will allow the city to care for a greater number of trees and keep them maintained, reducing the need for "repair work" as the trees grow, which should in turn reduce the number of citizen complaints. Chapter 12 and 13 can be used to develop pruning program objectives in your plan.

The town of Leesburg, Virginia also evaluated its current tree management organization and determined that they needed to develop a clear urban forestry policy, improve the organizational structure and staffing levels, and provide adequate financial resources for urban forest management (Town of Leesburg, 2006).

Every community is different, and the task of balancing community needs with urban forest and budget needs is complex. But the results of monitoring and evaluation can also provide reasons to celebrate. Change is inevitable and not always bad. It's important to identify successes in your plan. When a milestone is met, this is reason to show the community the improvements to their environment. Celebrate with press releases, arbor days, park openings and other publicity efforts to involve and educate the public. Keep in mind that a visible program results in more community support in both times of budget expansion and tightening.

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## Final Considerations

This publication series can provide you with a tool kit of information on how to develop and execute your urban forest management plan. Management is a continual process of learning and adapting to change (Figure 1). Reviewing the community management plan's vision, goals, objectives, and activities should be an important and on-going component of any management plan. A plan and its vision should not have a shelf life of 5, 7 or 10 years. If the ecological, economic or social assumptions that directed the initial plan change or become questionable, then the plan needs to be adjusted to meet the new realities.

In the aftermath of a hurricane, the health of a community's trees is about the last thing on anyone's mind. Urban forests will be secondary to ensuring public safety, mitigating hazards to property, cleaning debris, and restoring public services and utilities (Burban and Andersen 1994). In fair weather, however, urban forests should be a primary community concern. Careful planning for the allocation of resources to the urban forest will provide a community with a healthy, strong, wind-resistant forest that will help it withstand a hurricane. This fact should remind you of the need to consider hurricanes during your planning process and in fact, it makes considering hurricanes in your plans critical.

## Things to Remember:

- Objectives can have time lines but the plan itself should allow for change.
- **A clear vision, community participation, monitoring, and the ability to adapt your plan for an eventual hurricane or other event is good fiscal policy and ensures the sustainability of the urban forest and its services.**
- By considering the approaches and information presented in this chapter and integrating the tools from previous chapters, communities can develop objectives that will help prepare them to effectively respond to a hurricane.
- **The lessons learned from previous hurricanes and the tools in this series can be used to design objectives that will help communities develop pre-hurricane goals, objectives, and activities and restore their urban forests after hurricanes**
- Success of an urban forest management plan will require the members of a community to cooperate with each other. Include on your team anyone with a stake in maintaining a healthy urban forest: public agencies, businesses, institutional landowners, green industry contractors, and emergency management services. Cooperation will create a common vision that values the urban forest and a community that works together to restore itself after a hurricane.

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## Sample urban forest management plans, street tree master plans, and other documents

City of Davis, California  
*2002 Community Forest Management Plan*

City of Miami Beach, Florida  
*Hurricane preparedness fact sheet*

Georgia Forestry Commission  
*2001 Model urban forest book*

City of Horn Lake, Mississippi  
*2004 Tree Inventory Management Plan*

State of Mississippi  
*2005 Urban and Community Forestry Management Manual*

Charlotte, North Carolina  
*2005 City of Charlotte, North Carolina Municipal Forest Resources Analysis*. USDA Forest Service

Knoxville, Tennessee  
*Knoxville: Street Tree Master Plan*

New York City – Croton, New York  
*2004 Urban Forest Management Plan*

New York City – Morrisiana, New York  
*2006 Community Forest Management Plan*

New York City – Fort Greene Park, New York  
*2004 Urban Forestry Management Plan*

New York City – East Harlem, New York  
*2006 Community Forestry Management Plan*

City of Eugene, Oregon  
*1992 Urban Forest Management Plan*

City of Lacey, Washington  
*2005 Urban Forest Management Plan*

City of Seattle, Washington  
*Master Street Tree Plan and 2006 Draft Urban Forest Management Plan*

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