# COMMUNITY FOREST STORM MITIGATION PLANNING

*A Guide for North Carolina Communities*

## NORTH CAROLINA FOREST SERVICE
NCFORESTSERVICE.GOV

## Workbook

# NC FOREST SERVICE

# URBAN & COMMUNITY FORESTRY PROGRAM

# COMMUNITY FOREST STORM MITIGATION PLANNING

*A Guide for North Carolina Communities*



NORTH CAROLINA FOREST SERVICE
NCFORESTSERVICE.GOV

Workbook
2017

**Plan workbook written by**

**Connie Head, Consulting Urban Forester**

**Technical Forestry Services**

**706.202.5279 / tfshead@aol.com**

This workbook was originally developed by the Georgia Forestry Commission
and adapted to use for North Carolina by
the N.C. Forest Service, Urban and Community Forestry Program

and designed by Janet Muncy, Virginia Department of Forestry.

# TABLE OF CONTENTS

# HOW TO USE THIS WORKBOOK

This *Community Forest Storm Mitigation Planning Workbook* and the accompanying *Community Forest Storm Mitigation Plan Template* are intended as tools for North Carolina communities to use in assessing their community forest storm readiness, mitigating tree risk and reducing tree-related storm damage, and developing a community forest storm mitigation plan.

The workbook guides you through filling in the template, which serves as a basic framework for developing your Community Forest Storm Mitigation plan. As the template is filled in, gaps in storm readiness, tree risk mitigation and community forest management will be identified. As these gaps are addressed, the plan should be revised and updated. Communities may find it helpful to work with their neighbors to develop plans that are similar and include agreements to share resources.

Not all sections within the template will be applicable to every community. And some sections, while applicable, will require you to gather additional information or finish mitigation activities before they can be completed.

Copies of your current storm mitigation plan and other important storm mitigation documents should be stored in hard copy format in the office of the county emergency response manager and the tree care manager. They should also be made available on the government website or a cloud-based storage site where they can be viewed in the field using a smart phone, tablet, or computer by those involved in storm preparation, response and recovery.

Both the workbook and template are available as PDF and Word documents on the North Carolina Forest Service's Urban and Community Forestry Program Web site at http://ncforestservice.gov/Urban/Urban_Forestry.htm. Copies of the workbook and template can be printed out, placed in a three-ring binder, and distributed to those developing your plan. The completed template should be distributed to your storm mitigation team members, who should meet at least annually to review and update the document.

The North Carolina Forest Service can provide guidance in developing your plan and completing the template. For assistance, contact the County Ranger in your area by visiting the NCFS website. The Ranger can also provide you with a list of consultants in your area who can help you develop your community forest storm mitigation plan and community forest management program.

# INTRODUCTION

A community forest storm mitigation plan is an essential part of your community's hazard mitigation and emergency management plans and systems. The plan should focus specifically on ways to avoid or mitigate the damage trees cause during a storm or other catastrophic event and ways to avoid the loss of trees and tree canopy across a community.

The workbook and template are divided into four (4) parts:

## PART I. COMMUNITY SETTING

## PART II. STORM PREPARATION

## PART III. STORM RESPONSE

## PART IV. STORM RECOVERY

Your plan should include a description of your community setting for storm exposure and tree damage; the activities you will undertake to prepare for storms; how you will respond and begin short-term recovery, and the actions you will take for long-term recovery and restoration of your community forest.

This workbook includes suggested activities for preparation, response and recovery and, using the template, will guide you through the process of developing your plan.

# A. PLAN OBJECTIVES AND PURPOSES

The objectives of a community forest storm mitigation plan are to:



◆ Reduce the amount and severity of the damage and losses to people, property, the economy and the environment that results from tree failures during storm events, and

◆ Reduce tree canopy cover losses resulting from storm events.

The purpose of the plan is to:

◆ Provide information;

◆ Set policies;

◆ Describe actions to be taken related to trees and the community forest, and

◆ Effectively prepare for, respond to and recover from a storm event.

The plan is intended to be an active document that should be implemented on an ongoing basis and reviewed at least annually as well as just prior to and after each event.

# B. PLANNING STRATEGIES

The strategies recommended for community forest storm mitigation planning are to:

◆ Focus on preparation to improve response and reduce the level of recovery efforts;

◆ Gather, maintain and utilize accurate pre-storm, baseline data about the community forest resource and its management;



◆ Utilize a community forest storm mitigation team led by the tree care manager (preferably an arborist or urban forester) to manage the storm mitigation process;

◆ Provide regular information, education and communication to staff, team members and the community about storm mitigation;

◆ Reduce losses by implementing a routine tree risk assessment and management program and a long-term, comprehensive community forest management program, and

◆ Utilize an annual planning process to update the storm mitigation plan.

## C. PLAN BENEFITS

The development and implementation of a community forest storm mitigation plan will provide the following benefits:

◆ Reductions in tree failures and tree canopy losses;

◆ Improved community forest health and safety;

◆ Increased community forest benefits;

◆ Reductions in damage and losses of people and property due to trees;

◆ More efficient and effective response to storms;

◆ Increased reimbursement for tree losses, and

◆ Maintain and enhance community confidence in elected officials, city staff and community forest management program.

## D. EMERGENCY MANAGEMENT PROGRAMS

Responses to minor emergency events involving trees that require less than 24 hours to clear roadways, repair utilities and restore public safety are often handled by the street or public works departments. Major events that require longer periods of response, external resources and longer periods of recovery usually require the involvement of county, state and federal emergency management programs.

The community tree care manager should work with the local emergency management agency director or designee to fully understand and agree on the responsibilities, procedures and information required of them in hazard and storm mitigation. They should also understand what procedures and documentation are required for the community to be eligible for federal disaster assistance for storm debris removal.

The local emergency manager will contact the NC Emergency Management (NCEM) and the Federal Emergency Management Agency (FEMA) as needed prior to, during or after a storm event according to the protocol outlined in the community's hazard mitigation and emergency response plans.

The following information gathered from the NCEM, NCFS and FEMA websites describes these agencies' missions and roles in hazard and emergency management.

### 1.  North Carolina Emergency Management (NCEM)

General information: www.ncdps.gov/Our-Organization/Emergency-Management

County specific information: www.ncdps.gov/Emergency-Management/EM-Community/Directories/Counties/County-EM-Websites

### 2.  North Carolina Forest Service (NCFS)

www.ncforestservice.gov

**Mission:** To protect, manage and promote forest resources for the citizens of North Carolina.

**Strike Teams:** Strike team members coordinated by NCFS evaluate individual trees within a defined disaster area on public property and rights-of-way to assess storm damage and identify tree risks, recommend risk remediation and provide documentation to support a community's application for FEMA Public Assistance (i.e. debris management).

### 3.  Federal Emergency Management Agency (FEMA) Region IV

www.fema.gov/region-iv-al-fl-ga-ky-ms-nc-sc-tn

FEMA Region IV works closely with the emergency management agencies of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee to prepare for, protect against, respond to, recover from and mitigate all hazards. Region IV's natural risks include hurricanes, tornadoes, flooding, droughts, ice storms, earthquakes, wildfires, and tropical storms. Six of our eight states are hurricane-prone, so Federal Coordinating Officers have been pre-designated to plan for hurricane response issues and work closely with the state emergency management agencies.

FEMA also publishes guides that address hazard mitigation planning in general. While not specific to community forestry, the goals and processes are very similar. *Mitigation Ideas. A Resource for Reducing Risk to Natural Hazards*: www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf and *Local Mitigation Planning Handbook: www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf*.

# PART I. COMMUNITY SETTING

The degree of storm preparation necessary in your community and the type and amount of damage that is likely to result depends on:

◆ Your geography and size;

◆ Your storm history and exposure, including your climatological and meteorological conditions, and

◆ The level to which your community forest resource is being managed.

## A. COMMUNITY GEOGRAPHY AND SIZE

Your physical location in North Carolina; the topography within your jurisdiction; the size in square miles of your community; the number of miles of roads, and the population of your community all will have an effect on storm and damage potential.

There are three main physiographic regions in North Carolina: the **Appalachian Highlands**, the **Piedmont**, and the **Coastal Plain**. Locate your physiographic region on the map provided.

**Record on the template:**

✓ **The name of your community;**

✓ **The date of adoption and last update of your storm mitigation plan;**

✓ **Your physiographic region;**

✓ **Physical size of jurisdiction in square miles;**

✓ **Number of miles of roads, and**

✓ **Population according to the latest official census.**

## B. STORM HISTORY AND EXPOSURE

### 1. Potential Storms and Emergency Events

Your local hazard mitigation plan includes information on the types of hazards, including weather and storm events, which could occur in your community. Consider these hazards and storm events in terms of the amount of tree damage possible and how these events may increase the risk of tree failure—including uprooting, trunk failure, co-dominant stem failure and loss of large limbs.

In addition to reviewing your local hazard mitigation plan, do some additional research on the primary weather and catastrophic events that have occurred or are likely to occur in your community. Visit the *NOAA National Climatic Data Center* storm event database, or other sources of historical weather data listed here, for details on past storm events in your community.

Hail, wind damage and lightning can accompany a severe storm at any time of the year, but severe storms are more likely to occur in the spring and summer months with warm temperatures and strong weather fronts. Tornadoes may also accompany these fronts and severe storms.

Hurricane season in the Atlantic and southeastern US begins June 1 and ends November 30. North Carolina regularly experiences flooding, wind and tornadoes during tropical storms and hurricanes accompanied by significant tree damage.

Drought conditions, high temperatures and wind during the summer months can result in an increase in wildfire risk.

## SOURCES OF HISTORICAL WEATHER DATA

**National Oceanic and Atmospheric Administration (NOAA)**
www.noaa.gov/

**NOAA Storm Prediction Center**
www.spc.noaa.gov/climo/historical.html

**NOAA National Hurricane Center**
www.nhc.noaa.gov/

**NOAA National Climate Data Center**
www.ncdc.noaa.gov/stormevents/
https://www.ncdc.noaa.gov/climate-information/extreme-events

**State Climate Office of North Carolina**
http://climate.ncsu.edu

All of the possible storm events that can occur in North Carolina can cause considerable damage to trees, and those tree failures, in turn, result in damage to roads, utilities, facilities, buildings, vehicles and, in some cases, people. While we cannot control the occurrence of most of these events, we can prepare the community forest to better withstand their effects.

Descriptions of the damage to trees that can be expected at various wind speeds are included in the Enhanced Fujita Scale degrees of damage charts for hardwoods and softwoods shown below.

Note that damage occurs to softwoods at slightly lower wind speeds than hardwoods.

## For hardwood trees:

| Degree of Damage | Damage Description | Expected Wind Speed | Lower Bound Wind Speed | Upper Bound Wind Speed |
|---|---|---|---|---|
| 1 | Small limbs broken (up to 1" diameter) | 60 | 48 | 72 |
| 2 | Large branches broken (1" to 3" diameter) | 74 | 61 | 88 |
| 3 | Trees uprooted | 91 | 76 | 118 |
| 4 | Trunks snapped | 110 | 93 | 134 |
| 5 | Trees debarked with only stubs of largest branches remaining | 143 | 123 | 167 |

## For softwood trees:

| Degree of Damage | Damage Description | Expected Wind Speed | Lower Bound Wind Speed | Upper Bound Wind Speed |
|---|---|---|---|---|
| 1 | Small limbs broken (up to 1" diameter) | 60 | 48 | 72 |
| 2 | Large branches broken (1" to 3" diameter) | 75 | 62 | 88 |
| 3 | Trees uprooted | 87 | 73 | 113 |
| 4 | Trunks snapped | 104 | 88 | 128 |
| 5 | Trees debarked with only stubs of largest branches remaining | 131 | 112 | 153 |

As these descriptions show, the primary types of tree damage that occur during storms involving high winds are limb failures, trunk failures and whole tree failures.

The damage that occurs to trees from fire and major storm events is usually immediately apparent after a storm. Subsequent damage to trees as a result of chemical contamination, flooding, hail or major insect or disease infestations may be evident only later. The damage may not even be visible, but tree decline and death may eventually result, at which time dying and dead trees pose a considerable risk.

- ✓ **Check off on the template the primary types of weather and other catastrophic events that have occurred and impacted trees, or are likely to occur, in your community.**

## 2.  Snow and Ice Storms

Snow and ice storms typically occur in North Carolina between the months of December through March where freezing temperatures are possible.



- ✓ **Record on the template the months of the year when freezing temperatures are possible.**

- ✓ **Record on the template the largest single event snow totals that have occurred during the snowiest months in your area.**

## 3.  Rainfall and Flooding

Excessive rainfall and flooding, usually as a result of high amounts of precipitation, causes destabilization of trees, whole tree failures or tree death.

- ✓ **Record on the template the months that have the highest average annual precipitation in your area.**

- ✓ **Record on the template the months that have the lowest average annual precipitation in your area.**

## 4.       Droughts and Fires

Tree damage can result from periods of high temperatures and low moisture, such as during droughts. These drought conditions, combined with high winds, can predispose trees to root loss, decline and tree failures can result.

   ✓ **Record on the template the warmest months of the year in your area.**

The National Fire Protection Association (NFPA, www.nfpa.org) conducts a Firewise Communities Program that teaches residents about the hazards of wildfire and how they can prepare for and reduce the risk of home destruction due to wildfires. The program is co-sponsored by the USDA Forest Service, the US Department of the Interior and the National Association of State Foresters. Visit the Firewise website at www.firewise.org for a guide to Firewise principles and a Firewise tips checklist for homeowners. Resources are also available at www.ncfirewise.org.

   ✓ **Record on the template the months with the most frequent wildfire activity.**

   ✓ **Record on the template if your community is a designated Firewise Community.**

## 5. Other Significant Conditions

   ✓ **Record on the template any other significant geographic, climatological or meteorological conditions that predispose your community to storms or catastrophic events.**

## 6. Storm History and Records

   ✓ **Record on the template, in the chart provided, the severe storms and catastrophic events that have occurred over the last 30 years in your community.**

You may also use this chart to record storm events as they occur. Include the year, date if known (at least the month, if possible), the type of event, the severity and the type of damage that occurred.

# C. COMMUNITY FOREST RESOURCE MANAGEMENT

## 1. Tree Care Manager

For storm mitigation planning (and community forest resource management), it is recommended that someone be designated as the tree care manager and given the responsibility for both coordinating community forest resource management and storm mitigation planning. Ideally your tree care manager should be an arborist, urban forester or horticulturist and an ISA Certified Arborist[1].

For communities that do not have an urban forester or arborist on staff, they should consider designating an existing staff member, or hire a consulting urban forester or arborist, to fill this role.

---

[1]See www.isa-arbor.com for information on the International Society of Arboriculture's arborist certification program.

The designated tree care manager should have technical expertise, field experience and knowledge in community forest management, tree risk assessment, tree maintenance standards and best management practices. Computer software skills that include Microsoft Word, Excel, PowerPoint and geographic information systems are also desirable.

- ✓ **Record on the template the name, title and contact information of the community's tree care manager.**
- ✓ **Record on the template whether or not your tree care manager is an ISA Certified Arborist.**

## 2.   Tree City USA

More than 80 communities in North Carolina have been designated as a Tree City USA by the National Arbor Day Foundation. To be eligible, four (4) standards must be met. The community must:

1.   Have a tree ordinance;

2.   Hold an annual Arbor Day Celebration with an Arbor Day Proclamation;

3.   Have a tree board or committee, and

4.   Spend at least $2 per capita on community forest management.

- ✓ **Record on the template whether or not your community is a Tree City USA community; indicate the first year that you were designated as such.**
- ✓ **Record on the template the type of ordinance you have, your annual program expenditures, the number of members of your tree board and the date of your last Arbor Day celebration.**
- ✓ **Include in the template appendix a copy of your tree ordinance and a list of your tree board members and their contact information.**

## 3.   Management Plan

Many communities have also developed a management plan to guide their community forest management programs. These plans may be basic or more complex, may be developed annually or may have a five-year or longer time frame and may include plans for administration, field operations and information and education.

- ✓ **Indicate in the template whether or not your community has a forest or natural resources management plan; indicate when it was adopted and the most recent revision.**
- ✓ **Include in the template the name of the person responsible for administering and updating your community forest management plan.**

# PART II. STORM PREPARATION

Preparation for anticipated storm events will reduce the storm impact and damage that occurs during an event. Storm preparation has the following additional benefits:

◆ Improvement of local, state and federal information sharing;

◆ Identification of critical infrastructure;

◆ Coordinated response plans;

◆ Facilitation of mutual aid agreements for communities to share resources;

◆ Identification of capacity needs, and

◆ Provides opportunities for training and field exercises.

Keeping in mind the storm damage potential in your area, you should begin preparations for storm events by taking the following steps:

◆ Develop a storm mitigation team;

◆ Assess the community forest resource;

◆ Inventory available equipment and services;

◆ Develop memoranda of understanding and advanced readiness contracts;

◆ Develop a storm mitigation map;

◆ Implement a tree risk mitigation program, and

◆ Develop a communication, information and education program.

## A. STORM MITIGATION TEAM

Assemble a team of individuals who can contribute not only to storm preparation but also to storm response and recovery. Your tree care manager should lead the team and coordinate storm mitigation planning, preparation and response, as well as community forest recovery.

The tree care manager, in addition to coordinating and leading the team to complete the template and develop a community forest storm mitigation plan, should also coordinate an annual meeting to review the plan; discuss storm mitigation objectives, team member roles and procedures, and share preparation, response and recovery experiences, accomplishments and information and update the plan accordingly.

Specific roles and detailed responsibilities should be assigned to team members or reconfirmed during these annual meetings and job descriptions further developed to promote an organized approach to mitigation, preparation, response and recovery.

Your storm mitigation team should include individuals from the agencies, departments, organizations and companies listed below—as applicable to your community.

1. Emergency Management Personnel

2. Government Staff

3. Utility Companies and Departments

4. State Agencies

5. Contractors (debris removal, tree service, landscape)

6. Equipment and Materials Vendors (equipment rental, tree nursery)

7. Volunteer Organizations (tree board, local agency, non-profit and Tree Stewards)

8. Community Forest Management Program Sponsors

9. Additional Team Members and Emergency Contacts

   ✓ **Record on the template your storm mitigation team members' names, titles, radio number, phone numbers and e-mail addresses.**

## B. COMMUNITY FOREST RESOURCE ASSESSMENTS

One of the first tasks of the tree care manager in storm mitigation planning should be to review or gather information on the community forest resource, including:

◆ Total amount of tree canopy cover across the community;

◆ Number, location and size of public trees, especially street trees;

◆ Number, location and size of trees at high risk for failure;

◆   Estimate of the dollar value of the benefits that trees provide;

◆   Total annual cost of community forest management, and

◆   Benefit-to-cost ratio of community forest management and tree risk mitigation.

The tree canopy assessment will provide information on the percent of the community that is covered by tree canopy. A public tree inventory will provide detailed information on the number, location, size and condition of street trees. A tree risk assessment will provide information on which trees need immediate attention to mitigation the risk and reduce potential storm damage.

Using the tree canopy and tree inventory data, the value of the benefits provided by all trees within the community and specifically the public street trees, can be estimated. With information on the value of tree benefits and the total cost of management, a benefit-to-cost ratio can be calculated and used to justify tree risk assessment and community forest management activities and costs.

## 1.   Tree Canopy Assessment

Another way to gauge your storm damage potential related to trees is through a tree canopy cover assessment. The purpose of the assessment is to determine the amount of land area within your community that is covered by tree canopy. Tree canopy can be measured using aerial photography or satellite imagery and geographic information software. These measurements can be done periodically to detect tree canopy cover change and trends. The community should also set a goal for tree canopy cover and conduct these periodic measurements to assess the progress made toward achieving that goal.



✓   **Record on the template your community's current tree canopy cover percent and the year it was last measured; indicate the method used for your assessment; include historical information on previous tree canopy cover measurements.**

✓   **Describe the changes and trends in your tree canopy cover if you have completed multiple tree canopy cover assessments.**

✓   **Record on the template whether there is a community forest management plan to obtain the tree canopy cover goal; include your tree canopy cover goal (percent).**

## 2.  Public Tree Inventory

An inventory can provide important information on the number, location, type, size, condition and maintenance needs of public trees (including street, park, cemetery and school trees) and trees growing around public offices and facilities. Ideally, data should be collected using a handheld GPS and data recorder, which will facilitate the display and analysis of tree data. But, at a minimum, tree inventory information should be maintained in an Excel spreadsheet for easy access, updating and printing. A hardcopy of the tree inventory information should be maintained in the tree care manager's office.

At a minimum, the following information should be collected for each tree:

◆    Site type;

◆    Location (street, address, GPS coordinates);

◆    Species;

◆    Diameter Breast Height (DBH) (trunk diameter at 4.5 feet above the ground);

◆    Condition;

◆    Risk rating;

◆    Maintenance needs, and

◆    Site conditions.

The analysis should include the following data summaries:

◆    Number of trees by location;

◆    Number of trees by species;

◆    Number of trees by DBH;

◆    Number of trees by condition rating;

◆    List of trees recommended for regular inspection, and

◆    List of trees by level of risk.

✓ **Record on the template the date of your community's last tree inventory and the number of trees by site.**

✓ **Record on the template the number of street trees 24 inches and larger in trunk diameter at 4.5 feet above the ground (a measurement known as DBH).**

✓ **Record on the template whether or not a map of the locations of street trees 24 inches DBH and greater is available from the tree care manager.**

## 3.   Tree Risk Assessment

An assessment of tree risk can be completed during the inventory of public trees or as a separate activity focusing specifically on identifying trees with an elevated risk of failure.



Only those individuals qualified to conduct tree risk assessments should do so. If your community does not have an arborist or forester on staff who can perform this task, you can contract with a consultant to complete the assessment. It is recommended that you hire only consultants who are ISA Certified Arborists that have experience in performing tree risk assessments and have the Tree Risk Assessment Qualification.

Tree risk assessment procedures should conform to the most current and professionally accepted standards and best management practices. The following standards and best management practices for tree risk assessment have been developed by professionals and are published by the International Society of Arboriculture.



◆ *ANSI A300 (Part 9)—2011, American National Standard for Tree Care Operations—Tree, Shrub and Other Woody Plant Management—Standard Practices (Tree Risk Assessment a. Tree Structure Assessment)*

◆ *Tree Risk Assessment Best Management Practices* (companion publication to the ANSI A300 Part 9 standard practices)

Another excellent source of information on trees and risk management, which should be reviewed by everyone developing a storm mitigation plan, is:

◆ *Urban Tree Risk Management: A Community Guide to Program Design and Implementation,* USDA Forest Service, Northeastern Area, State and Private Forestry, Publication NA-TP-03-03, Coordinating Author Jill D. Pokorny (available online at www.na.fs.fed.us/spfo/pubs/uf/utrmm)

Using the methodology described in the ANSI standards, a Level-1 tree risk assessment should be performed on all trees growing along high-priority streets within the community—those streets leading to and from emergency and critical facilities. A Level-2 tree risk assessment should then be performed on all trees considered to be at risk growing along the priority streets.

✓ **Record on the template whether or not your community has on file copies of the ANSI standards and best management practices for tree risk assessment.**

✓ **Record on the template whether or not your community has in place a tree risk assessment program or plan.**

✓ **Record on the template the frequency and most recent date of the Level-1 tree risk assessment performed on all trees growing along priority streets.**

✓ **Record on the template the frequency and most recent date of the Level-2 tree risk assessment performed on trees at risk growing along priority streets.**

Trees found to be at risk will most often be large trees with damaged roots, structural defects or significant amounts of deadwood. These conditions can cause either part or the whole tree to fail, potentially causing serious damage. Tree risk mitigation may require:

◆ Pruning to remove deadwood or structurally weak branches, improve form or increase clearance;

◆ Supplemental support (cables and bracing rods);

◆ Further inspections, and

◆ Removal if in irreversible decline or their risk of failure cannot be otherwise mitigated.

These basic activities should be completed as soon as possible, once the need is identified, to mitigate tree risk and should also become routine activities within the community forest management program.

## 4. Tree Benefits and Value

Trees are an important part of our community's infrastructure. They provide us with many valuable and irreplaceable environmental, economic and social benefits. To strengthen support for storm mitigation and community forest management efforts, it is useful to know and promote the functions, benefits and value of community trees. Using tree canopy assessment or public tree inventory data, the value of the benefits provided by trees can be calculated.

*i-Tree Tools for Assessing and Managing the Community Forest* available at www.itreetools.org include calculations of tree value in the i-Tree Canopy component for tree canopy values and in the i-Tree ECO component for tree inventories. Additional methods used for calculating the value of trees include:

◆ Council of Tree and Landscape Appraisers. *Guide for Plant Appraisal*, 9th Edition, International Society of Arboriculture, www.isa-arbor.com, and

◆ *National Tree Benefits Calculator*, http://treebenefits.com/calculator/.

Include the amount and annual dollar value of the following benefits provided by your tree canopy and street trees:

◆ Aesthetic and other benefits;

◆ Air quality benefits;

◆ Carbon sequestration benefits;

◆ Energy benefits, and

◆ Stormwater benefits.

    ✓ **Record on the template the amount and value of each of the benefits provided by your community's tree canopy.**

    ✓ **Record on the template the amount and value of each of the benefits provided by your public street trees.**

## 5. Community Forest Management Costs

While your trees provide considerable benefits that can be valued in dollars, your trees also cost money to manage. You should maintain accurate records of the cost of managing your community trees. The following are examples of expenses that may be included in your community forest management costs:

◆ Tree inventory (staff or contract)

◆ Tree risk assessment (staff or contract)

◆ Tree purchases

◆ Tree planting (staff)

◆ Tree planting (contract)

◆ Mulching (labor)

◆ Mulch materials

- ◆ Pruning (staff)

- ◆ Pruning (contract)

- ◆ Supplemental support and lightning protection system installation (contract)

- ◆ Pest management

- ◆ Irrigation (staff)

- ◆ Inspection (staff)

- ◆ Removal (staff)

- ◆ Removal (contract)

- ◆ Equipment and supplies

- ◆ Consulting services

- ◆ Infrastructure repairs

- ◆ Leaf and limb pick-up

- ◆ Liability/claims for damages

- ◆ Administration (staffing, office supplies, education, advertising and promotion)

- ◆ Other costs (provide description)

  - ✓ **Record on the template the total annual cost of community tree management by category, and calculate the total community forestry program expenditures.**

  - ✓ **Record on the template the percentage of all public trees that are street trees; calculate the pro-rated cost of managing the street tree population.**

## 6. Benefit-to-Cost Ratio of Community Forest Management

With knowledge of the total value of your street trees and information on your annual tree management or tree risk mitigation costs, you can also calculate the benefit-to-cost ratio of your trees. Divide the dollar value of the annual benefits by the total annual cost for management to arrive at the value of benefits returned by the trees for each dollar spent on their management.

- ✓ **Record on the template the benefit-to-cost ratio of your community tree management and tree risk mitigation program for your total tree canopy and for your public street trees.**

# C. STORM MITIGATION MAP

A storm mitigation map that includes the locations of critical facilities, transportation corridors (especially high-priority roads to critical and emergency facilities), street trees (especially very large trees and trees at risk) and emergency response sites is an essential tool for storm preparation, response and recovery. After this information is placed on the map, priorities for tree risk mitigation should become apparent where priority roads, large trees and critical facilities intersect and overlap. When completed, the storm mitigation map should be printed out, distributed to all storm mitigation team members and disseminated in preparation for storms and for review during the annual storm mitigation planning meeting. It should also be made available online.

✓ **Record on the template whether or not you have developed a storm mitigation map, where copies of the map are available and if the map can be accessed online.**

The locations of the following facilities and infrastructure should be included on the storm mitigation map:

## 1.   Critical Facilities
◆   Hospitals and other critical health care facilities

◆   Fire stations

◆   Police stations

◆   Communications networks and facilities

◆   Electric utilities and other utility networks and facilities

◆   Water system

◆   Sanitary sewer system

## 2.   Transportation Network
◆   Emergency evacuation routes

◆   Street network

◆   Priority streets to critical facilities (highlighted)

## 3.   Trees
◆   All public trees

◆   Large canopy public trees (highlighted)

◆   Tree canopy density

◆   Trees at risk

## THE URBAN TREE RISK INDEX

*Urban Tree Risk Index* (UTRI) is a tool to help city arborists/foresters and emergency management personnel define, rank and map the areas of greatest need for tree risk mitigation. This GIS-based system results in the development of a map and database that can be used for prioritizing tree risk mitigation activities prior to, during and after a storm event.

The UTRI is developed by the arborist/forester in partnership with emergency management personnel and city/county or regional planning GIS staff. The critical facilities, road segments leading to those critical facilities, population density and the tree canopy along each road segment are ranked. The layers of information are combined to create the urban tree risk index. Field verification of the index values is conducted, and the values are adjusted based on field conditions.

For more information on the Urban Tree Risk Index, visit www.UrbanForestrySouth.org and search for "UTRI".

## 4.  Emergency Response Sites

◆  Emergency management centers

◆  Homeland Security offices

◆  Personnel and equipment staging areas

◆  Debris staging areas

◆  Debris storage areas

✓  **Record on the template the information that is included on your storm mitigation map.**

✓  **Record on the template the person responsible for developing and updating your storm mitigation map and date of last update.**

# D. TREE RISK MITIGATION

After the potential for storm and tree damage is assessed, information is gathered on the community forest resource and a tree risk assessment is completed, the process of mitigating tree risk should begin immediately by starting short-term tree risk management activities. A long-term plan for tree risk mitigation that involves improvements in the overall community forest management program and health and structural stability of the tree resource should then be developed and implemented. The tree care manager should be assigned the responsibility for completing or coordinating tree risk mitigation and further developing the community forest management program.

## 1.    Short-term Tree Risk Mitigation

Trees found to have an elevated risk of partial or whole tree failure should be pruned, removed or cabled and braced where feasible and effective as soon as they are identified to mitigate the immediate risk. Short-term tree risk mitigation should begin with the following activities:

◆    Risk-reduction pruning;

◆    Supplemental support (cabling and bracing);

◆    Installation of lightning protection systems;

◆    Pest management, and

◆    Risk-reduction removals.

The installation of lightning protection systems and the management of pest infestations should be completed to improve tree health and reduce the potential for tree damage and decline. In addition to reducing tree risk through maintenance, an annual tree planting program to replace trees removed for risk mitigation and to improve the overall quality of the community forest and resiliency to storms should be implemented.

**Record on the template the following:**

✓    **Total number of trees identified with a risk of partial or whole tree failure during the last tree risk assessment;**

✓    **Number of trees scheduled to be pruned for risk reduction annually;**

✓    **Number of trees scheduled to be cabled/braced for risk reduction annually;**

✓    **Number of trees scheduled for installation of lightning protection systems;**

✓    **Number of trees scheduled for pest management;**

✓    **Number of trees scheduled to be removed for risk reduction annually, and**

✓    **Number of trees scheduled to be planted to replace trees removed for mitigation annually.**

## 2.  Long-term Tree Risk Mitigation

While implementing a tree risk management program, many other community forest management activities in addition to those already discussed in this workbook can be implemented to mitigate tree risk and storm damage on a long-term basis. These components and activities include improving policies, procedures and regulations; increasing educational opportunities, and encouraging more responsibility and involvement of the entire community in tree care.

Program components that will promote long-term tree risk and storm damage mitigation include:



- ◆ Tree-care standards and best management practices
- ◆ Tree ordinance updates
- ◆ Ongoing training program for tree-care personnel
- ◆ Established tree-care budget
- ◆ Alternate program funding mechanisms
- ◆ Tree bank
- ◆ Routine street-tree inspection program
- ◆ Routine large-tree inspection program
- ◆ Routine pruning program
- ◆ Routine tree planting program
- ◆ Routine tree mulching, irrigation and soil aeration
- ◆ Recommended tree species list
- ◆ Species selection guidelines
- ◆ Site selection guidelines
- ◆ Tree planting guidelines
- ◆ Minimum rooting areas and soil volume requirements
- ◆ Growing-space protection requirements
- ◆ Critical root-zone protection requirements
- ◆ Public information and education program
- ◆ Program analysis and feedback
- ◆ Species to avoid or not permitted list

    ✓ **Record in the template the additional community forest management program elements that have been adopted and implemented that will contribute to long-term storm mitigation.**

# E. EQUIPMENT AND SERVICES

The equipment required and available for storm mitigation, response and recovery should be inventoried annually and kept maintained so that it is operable and ready to use when needed. Maintain an up-to-date list of the type and amount of available equipment along with the department or other source that will supply the equipment (local government, equipment rental vendor, contractor or another government entity).

The type of equipment that is likely to be needed for storm response and recovery includes (but is not limited to):

| | | |
|---|---|---|
| ◆ Supervisor vehicles | ◆ Lighting equipment | ◆ Clipboards |
| ◆ Crew vehicles | ◆ Chain saws | ◆ Data sheets |
| ◆ Aerial lift trucks | ◆ Hand saws | ◆ DBH tapes |
| ◆ Loaders | ◆ Pole pruners | ◆ Safety vests |
| ◆ Chippers | ◆ Cell phones | ◆ Hardhats |
| ◆ Refuse packers | ◆ Portable radios | ◆ Chain saw chaps |
| ◆ Dump trucks | ◆ Computers/tablets | ◆ Eye protection |
| ◆ Barricades | ◆ GPS units | ◆ Ear protection |
| ◆ Traffic safety cones | ◆ Cameras | ◆ First-aid kits |

✓ **Record on the template the equipment needed, the number needed of each and the availability by amount and source.**

# F. MEMORANDA OF UNDERSTANDING AND ADVANCED READINESS CONTRACTS

Depending on the size, severity and impact of a storm event, the community will likely have to rely on outside sources of materials and services. Consider whether or not your community has the training, resources or capacity to provide or purchase these materials and services. When possible, cooperate with surrounding communities, local agencies and non-profit organizations to provide equipment, materials and services. Execute memoranda of understanding with these individuals to describe the nature of the cooperative agreement. You may need to hire contractors to perform some services or contact vendors for large quantities of supplies during storm preparation, response or recovery. By executing advanced readiness contracts with these companies, you will be better prepared and know what to expect in terms of costs.

The types of services and supplies that might be necessary during storm response and recovery related to trees include:

◆ Staffing

◆ Equipment

◆ Debris removal

◆ Mulch grinding

◆ Tree pruning

◆ Tree removal

◆ Tree risk assessment

◆ Nursery stock

◆ Tree planting

## 1. Memoranda of Understanding

Memoranda of understanding (MOUs) that outline the sharing of personnel, materials, functions, services and equipment for storm mitigation, response and recovery should be completed between the government and those willing and able to provide such resources. MOUs are not binding contracts but clearly establish expectations for providing and receiving needed assistance.

Complete the following steps to execute your MOUs:

◆ Hold a meeting with neighboring communities, agencies and organizations to discuss what functions, services or resources will be needed and shared. You may meet individually or collectively with the parties that will be involved. If several parties will operate in conjunction with one another, also discuss and determine how they will operate together.

◆ Write out the main purpose of each agreement. Detail the specific outcomes that are expected.

◆ Determine an appropriate timeline for the beginning and end of the partnership or an appropriate time frame. Be specific and include the dates in the MOU. Include a mechanism for terminating the MOU.

◆ Include details on the functions, services and resources to be provided by each party.

◆ Have all parties review, sign and authorize the MOU.

◆ Include contact information for all parties.

◆ Distribute copies to all parties.

◆ Review at least annually and revise and re-execute as necessary.

MOUs are commonly executed with neighboring communities, local agencies, non-profit organizations and other individuals and groups.

✓ **Record on the template the names of the communities, agencies and organizations with whom you have an MOU in place; include copies of the MOUs in the template appendix.**

## 2. Advanced Readiness Contracts

Advanced readiness contracts (ARCs) should be executed with equipment rental vendors, debris removal contractors, mulch grinding contractors, tree service contractors, tree suppliers and landscape contractors. These contracts are legally binding and should include a description of the services to be provided, the cost of the services and the standards to be met when executing the services. By preparing and executing these ARCs before a storm occurs, the capacity for storm preparation, response and recovery should be increased, and the overall cost of the same should be reduced.

Include the following in each ARC:

◆ Names of all parties involved;

◆ Address and contact information for all parties;

◆ Contract period with a beginning and ending date;

◆ Mechanism for terminating the contract;

◆ Detailed description of services;

◆ Standards to be met while providing service (safety, performance, results);

◆ Purchasing requirements;

◆ Cost for services;

◆   Payment schedule;

◆   Signatures of authorized representatives, and

◆   Date of execution of contract.

ARCs are commonly executed with equipment rental vendors, debris removal contractors, mulch grinding contractors, tree service contractors, tree suppliers and landscape contractors.

✓   **Record on the template the names of the contractors with whom you have an ARC in place; include copies of the ARCs in the template appendix.**

# G. COMMUNICATION, INFORMATION, EDUCATION AND AWARENESS

## 1.  Communication

A designated call center for notification of fallen and hazardous trees and tree damage should be established.

✓   **Record on the template the location and contact information for the designated call center for notification of fallen and hazardous trees and tree damage; include the physical address, phone number, fax number, website, e-mail address and director or primary contact person.**

The primary communication among storm mitigation team members during storm events should be through an established system of radios or cell phones. The contact list of storm mitigation team members that includes cell phone and radio numbers should be distributed in printed form and placed online for access through computers, tablets and smart phones. These communication devices should be maintained in a fully charged condition prior to any predicted event and on a daily basis in preparation for unpredictable events.

Regular and timely information should be provided internally to staff and externally to the public through a variety of media.



*Photo by Nick Smallwood - Mar 12, 2014*

## 2.   Information and Education

**Internal Information Sharing**

During storm preparation, information can be shared internally through:

◆   Phone calls;

◆   E-mails;

◆   Predetermined and set up cloud-based storage site, and

◆   Meetings (notices, agendas and minutes).

✓   **Record on the template the preferred and chosen methods for internal information sharing.**

✓   **Record on the template the individual responsible for coordinating internal information sharing.**

**External Information Sharing**

Information can be shared externally through:

◆   Government websites;

◆   Community forest management program website;

◆   Neighborhood association website;

◆   Facebook page;

◆   Twitter account;

◆   Phone;

◆   E-mail;

◆   Cloud-based storage site;

◆   Pamphlets and brochures;

◆   Meetings (quarterly, semi-annual, annual);

◆   Scripts and recorded public service announcements, and

◆   Press releases and newspaper articles.

✓ **Record on the template the preferred and chosen methods for external information sharing.**

✓ **Record on the template the individual responsible for external information sharing and education.**

## Information and Education Topics

Written scripts, sample press releases and recorded public service announcements can be prepared and made available in the county emergency management office, public information office or tree care manager's office. Distributing information on the following topics related to storm preparation, response and recovery are recommended:

◆ Benefits of trees;

◆ Tree maintenance standards and best management practices;

◆ How to hire an ISA Certified Arborist;

◆ Chain saw safety;

◆ The location and contact information of the designated call center for notification of fallen trees and tree damage;

◆ Magnitude of the storm;

◆ Debris pick-up schedule and procedures;

◆ Expected clean-up time;

◆ Post-storm hazards (hangers, leaning trees, downed power lines);

◆ Type of debris to be collected;

◆ Caring for storm damaged trees, and

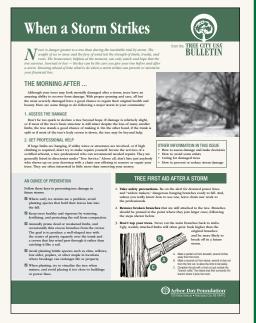◆ Tree selection and planting best management practices.

The tree care manager should keep these scripts and PSAs up to date, with the assistance of the storm mitigation team. The information can be distributed and broadcast via websites, social media, radio stations, television stations and newspapers within the local area.

Ongoing education on tree care, tree risk and community forest management will enhance both short- and long-term tree risk mitigation. There are many tree care and tree risk mitigation resources accessible on the Internet, including educational brochures that are available from the *National Arbor Day Foundation*.



## TREE CITY USA BULLETIN #2: WHEN A STORM STRIKES

With the exception of 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, trunks and roots. Survival or loss—the key can be the care you give your tree before and immediately after a storm.

This bulletin is dedicated to helping people who care about trees minimize the impact of storms on our community forests.

✓ **Record on the template whether or not you have written scripts, press releases, public service announcements or educational brochures available for disseminating information to the public.**

✓ **Record on the template in the chart provided the topics addressed by the written scripts, public service announcements, press releases, websites and social media content and brochures.**

✓ **Record on the template the media outlets that will be used for disseminating this information.**

✓ **Record on the template the individuals responsible for distributing information and educational materials on storm preparation, response and recovery to the public.**

## 3. Awareness

Storm, weather and emergency event preparedness is promoted statewide and nationally through awareness programs during designated awareness weeks. Local awareness information and education can be coordinated with these awareness weeks and days. These awareness programs include:

- ◆ Air Quality Awareness Week
- ◆ Fire Prevention Week
- ◆ Hurricane Preparedness Week
- ◆ Severe Weather Preparedness Week
- ◆ Tsunami Awareness Week
- ◆ Flood Awareness Week
- ◆ Heat Awareness Day
- ◆ Lightning Safety Awareness Week

     ✓ **Record on the template the upcoming dates of statewide and national awareness weeks and days.**
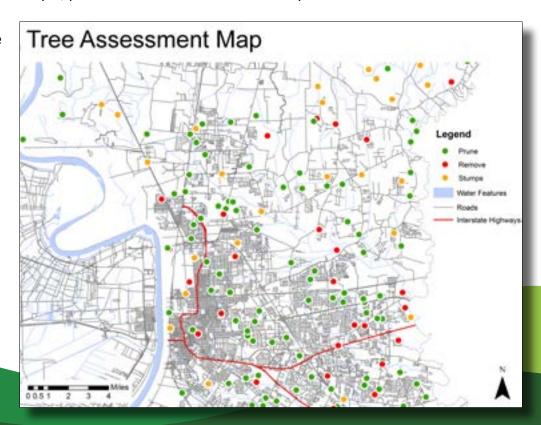
# H. PREPARATION RECORD KEEPING

The following information and records should be kept on file in the tree care manager's office, included in the template and placed online in a cloud-based storage service for ease of access during preparation, response and recovery activities.

- ◆ Storm mitigation team contact information

- ◆ Storm mitigation team meeting announcements, agendas and minutes

- ◆ Community Forest Storm Mitigation Plan

- ◆ Storm mitigation map

- ◆ Memoranda of understanding

- ◆ Advance readiness contracts

- ◆ Data and cost information for:

  - ➢ Program administration (personnel and overhead)
  - ➢ Tree-canopy assessments
  - ➢ Tree-risk assessments
  - ➢ Tree-inventory assessments
  - ➢ Tree pruning

  - ➢ Cabling and bracing
  - ➢ Lightning protection
  - ➢ Tree removal
  - ➢ Other tree maintenance

- ◆ Date, amount and source of volunteer hours for program activities

- ◆ Public information scripts, public service announcements and press releases

✓ **Record on the template the records maintained by your community.**



Tree Assessment Map

# PART III. STORM RESPONSE

Community forest storm response begins with the mobilization of resources immediately prior to an anticipated event and continues through the short-term recovery efforts required to restore community-wide clearance of fallen trees and woody debris. Initial storm response focuses on:

- Mobilization of resources;

- Clearing fallen trees and woody debris from high priority areas, then entire community;

- Debris management;

- Tree risk and damage assessments;

- Public information;

- Record keeping, and

- Cost reimbursement through FEMA public assistance grants.

## A. MOBILIZATION

The responsibility for mobilization of equipment and resources should be assigned to a member of the storm mitigation team. The removal of fallen trees and woody debris will begin immediately as storm damage is identified by debris removal crews and calls are received providing information on the location of downed trees and damage. All tree, limb and stump removal should be done in accordance with Occupational Safety and Health Administration (OSHA) rules and regulations.

Priorities for mobilization should be established by the community, using the Storm Mitigation Map. Crews should be directed to clear fallen trees and woody debris from the highest priority areas first, including:

- Priority roads

- Priority facilities

- Emergency evacuation routes

- Buildings, vehicles or other situations with a personal injury

- Buildings and vehicles without injured persons

- Utility repair

- Remaining rights-of-way, public buildings and public facilities

  - ✓ **Record on the template the priority areas for the removal of fallen trees and woody debris.**

  - ✓ **Record on the template the person responsible for mobilizing resources to respond to storm damage.**

# B. DEBRIS MANAGEMENT

## 1. Debris Staging and Storage

During storm preparation, one or more debris storage sites that will accommodate large volumes of woody debris and logs should have been established. The routes to these debris storage areas should be cleared immediately after the routes to critical facilities have been cleared.

✓ **Record on the template the location of all debris storage sites.**

✓ **Record on the template the person responsible for coordinating debris staging and storage.**

Woody debris should be kept separate and free from metals, plastics or other contaminants so that it can be utilized later. An initial sorting of debris should be done at each debris storage site to the extent practical to sort brush and limbs from trunks that may be marketable as saw logs.

Property owners should keep woody debris separate from garbage, yard waste and demolition debris. Public service announcements should inform property owners about pick-up times and schedules and emphasize that the removal of standing trees and woody debris on streets leading to critical facilities will be a priority.

Brush and limbs should be chipped for mulch and be made available free to the public after storm response and short-term recovery are complete. An effort should be made during long-term storm recovery to utilize mulch for mulching all public trees where practical. Chips not suitable for mulch should be marketed as bio-fuel.

Saw logs should be marketed to area saw mills or other local wood turners for use as dimensional lumber, furniture or other products.

## 2.  Debris Estimation

The following FEMA resources (www.fema.gov) provide information on debris management and estimation:

◆   *Public Assistance Program and Policy Guide,* FP 104-009-2, April 2017

◆   *Debris Estimating Field Guide*, FEMA 329, September 2010

   ✓   **Record on the template the person responsible for debris estimation.**

# C. TREE RISK AND DAMAGE ASSESSMENTS



After the initial response, the community can utilize government staff, consultants, Urban Forest Strike Teams[2] to assess tree risk immediately following a storm as roads are cleared and trees can be accessed.

Tree risk assessment crews will perform a Level-1 risk assessment as soon as it is safe to travel in the affected area. The location of trees and stumps needing pruning or removal for risk mitigation and hazard reduction as determined by ISA Certified Arborists or other trained personnel shall be recorded using either a GPS-based data collection system or paper tally sheets. Other information needed for FEMA Public Assistance shall be recorded. Some trees may be identified for a Level-2 Risk Assessment by the city/county arborist/forester.

Particular attention should be paid to trees with:

◆   Hangers (detached limbs hanging in the crown)

◆   Splitting limbs

◆   Splitting trunk

◆   Leaning trunk with soil broken and heaved opposite the lean

◆   Exposed heartwood



---

[2]Contact the NCFS U&CF Coordinator to request tree damage assessment assistance from the Urban Forest Strike Teams (UFST). UFST can also be ordered through NCEM in coordination with NCFS.

**Record on the template:**

- ✓ **The groups or individuals who will be performing tree risk and damage assessments.**

- ✓ **The person responsible for coordinating tree risk and damage assessment crews.**

- ✓ **The types of conditions that will require pruning or the removal of additional standing trees due to their imminent risk of failure and damage potential.**

- ✓ **The person responsible for determining which standing trees should be removed.**

The location and public trees that are not hazardous but meet the following criteria should also be noted during tree risk assessment and should be removed after initial response and recovery:

- ◆ Primary trunk failure (broken tops, less than 50 percent of the crown remaining);

- ◆ Co-dominant trunk failure with less than 50 percent of crown remaining, and

- ◆ Multiple limb failures with less than 50 percent of the crown remaining.

## D. INFORMATION

During storm response, information provided to the community should focus on safety, tree risk and debris cleanup efforts. The scripts, press releases and public service announcements developed in preparation for an event should be customized to fit the details of the current storm event. After initial response is completed, information and education can be refocused on long-term recovery and restoration of the community forest.



The person responsible for providing information and education during storm response, if not the tree care manager, should work closely with the tree care manager to make sure that information being provided to the public regarding trees is accurate.

- ✓ **Record on the template the person responsible for providing public information during a storm event.**

# E. RESPONSE RECORD KEEPING

During initial storm response and short-term recovery, the following records should be retained:



- ◆ Tree and debris removal call log;
- ◆ Debris removal costs;
- ◆ Debris volume estimates;
- ◆ Number and location of trees removed;
- ◆ Number and location of trees pruned;
- ◆ Number and location of stumps removed;
- ◆ Hazardous tree, limb and stump removal costs;
- ◆ Contractor invoices;
- ◆ Staff hours by person;
- ◆ Equipment hours by piece of equipment;
- ◆ Volunteer hours by person and activity;
- ◆ Volunteer contact information, and
- ◆ Tree damage assessment data and costs.

Documents and record keeping required by FEMA for obtaining Public Assistance grant funding for reimbursement of response and recovery costs are described in the following section.

# F. FEMA PUBLIC ASSISTANCE GRANTS

FEMA provides Public Assistance grant funding for the removal of hazardous trees, limbs and stumps that present immediate threats to lives, public health and safety or improved property and meet other eligibility criteria specified in the *Public Assistance Program and Policy Guide*. FEMA has specific eligibility criteria and documentation requirements for funding these items and encourages work to be done on a one-time charge per tree basis.

## 1.    Hazardous Trees Documentation

Hazardous tree removal is eligible for Public Assistance grant funding for all incident damaged trees with either a split trunk; a broken canopy; or is leaning at an angle greater than 30 degrees. Trees must be six inches or larger in diameter measured at 4.5 feet above the ground to be eligible.

Documentation required for hazardous tree removal includes:

◆ Specifics of the immediate threat with the U.S. National Grid (USNG) location and photograph or video documentation that establishes the item is on public property;

◆ Diameter of each item removed (measurement must be 4.5 feet up the trunk from the ground); and

◆ Equipment used to perform the work.

    ✓ **Record on the template the documentation retained for hazardous tree removal.**

## 2. Hazardous Limbs Documentation

The costs of removal of broken limbs two inches or larger in diameter measured at the point of break that pose an immediate threat to life, public health or safety, or pose an immediate threat of significant damage to improved property, are eligible for reimbursement of Public Assistance grant funding.

Documentation required for hazardous limb removal includes:

◆ Specifics of the immediate threat with the U.S. National Grid (USNG) location and photograph or video documentation that establishes the item is on public property;

◆ Diameter of each item removed; and

◆ Equipment used to perform the work.

    ✓ **Record on the template the documentation retained for hazardous limb removal.**

## 3. Hazardous Stumps Documentation

Public Assistance grant funding is available for the removal of stumps 24 inches or larger in diameter measured at 24 inches above the ground that have 50 percent or more of their root ball exposed. Reimbursement for the removal of stumps less than 24 inches in diameter will be based on the volume or weight.[3]

Documentation required for hazardous stump removal includes:

◆ Specifics of the immediate threat with the U.S. National Grid (USNG) location and photograph or video documentation that establishes the item is on public property;

◆ Diameter of each item removed (measurement must be 2-feet up the trunk from the ground for stumps);

◆ Quantity of material to fill root-ball holes; and

◆ Equipment used to perform the work.

   ✓ **Record on the template the documentation retained for hazardous stump removal.**

   ✓ **Record on the template the person responsible for documenting the hazardous trees, limbs and stumps removed.**



[3]Please see *Public Assistance Program and Policy Guide Appendix E (Stump Conversion Table) and Appendix F (Hazardous Stump Worksheet)*, for additional information on the estimated volume of various size stumps.

# Notes:

# PART IV. STORM RECOVERY

As storm response and short-term recovery efforts are completed, long-term recovery of the community forest can begin. This recovery includes the following steps:

◆ Post-storm mitigation analysis;

◆ Inventory of tree losses;

◆ Inventory of potential planting sites;

◆ Selection of appropriate species for planting for each site;

◆ Development of tree replacement plan;

◆ Mobilization of tree replacement partners;

◆ Continuation of ongoing tree risk mitigation;

◆ Ongoing distribution of information and education focusing on community forest recovery, and

◆ Maintaining records of storm recovery costs and activities.

After major tree losses, recovery efforts will focus on the replanting of trees lost and restoration of the community's tree canopy. Replanting projects provide the community with opportunities to work together and build long-term partnerships. Engage storm mitigation team members in your restoration efforts, along with the communities, organizations, agencies, contractors and vendors with whom you have in place a current memorandum of understanding or advanced readiness contract.



During this period, the government will focus on the replacement of trees on public properties—along streets and around public facilities, on school campuses and in parks and cemeteries. The government can also assist private property owners in their replanting efforts by facilitating partnerships and providing information and education on tree replacement and planting.

# A. POST-STORM MITIGATION ANALYSIS

The storm mitigation team should meet within 30 days after short-term recovery activities are complete to review the community forest storm mitigation plan and make any changes necessary to the information, policies and action steps it contains.



Discuss the activities that contributed the most to the mitigation of tree-related damage during the most recent storm. List the greatest areas of need in preparing for future storms.

✓ **Record on the template the activities that contributed most to the mitigation of tree-related damage and losses during the most recent storm(s).**

✓ **Record on the template the greatest areas of need identified during the most recent storm(s) for preparation and mitigation for future storms.**

# B. SUMMARY OF TREE LOSSES

An accounting of the total number of public trees lost during the storm should be made using tree damage assessment data and subsequent inventories of public trees. Summarize the data by species and DBH, and use the summaries to assist in the selection of replacement tree species.

✓ **Record on the template the total number of public trees lost in the most recent storm by species and DBH category.**

# C. INVENTORY OF POTENTIAL PLANTING SITES



Public trees lost during a storm should be replaced on a one-to-one or greater basis, with trees equal to or greater in mature size, as resources permit to maintain no net loss of tree canopy cover. Large canopy trees should be planted wherever space permits to further maintain tree canopy. Where it is not possible for trees to be replaced in the same or nearby location, they should be planted on other streets or public property. Refer to the community's list of trees recommended for planting for guidance on typical mature tree height.

Trees that typically grow to heights of 50 feet or taller at maturity are considered to be large trees. Trees that typically grow to heights of greater than 25 feet but less than 50 feet at maturity are considered to be medium trees. Trees that typically grow to heights of less than 25 feet at maturity are considered to be small trees.

Complete an inventory of the location and type of available planting sites on public property as soon as practical after storm response and short-term recovery are completed.

> ✓ **Record on the template in the spreadsheet provided (or develop your own spreadsheet in Excel) all tree replacements and recommended species to be planted by site type (streets, parks, cemeteries, schools, public facilities), location name, street, address, available growing space.**

## D. TREE SPECIES SELECTION

The tree species selected for replacement planting on a site should be compatible with the site conditions, including above- and below-ground growing space. The mature size, crown shape, form, compatibility with the area's soils and climate should also be considered during tree-selection decisions. Fast-growing species with weak wood and species with inherent structural defects or significant pest issues should be avoided for planting along street rights-of-way, in parks and cemeteries and around public buildings and facilities.



In our area, some species to avoid planting include:

◆ Bradford Pear

◆ Silver Maple

◆ Royal Paulownia (Princess Tree)

◆ Ash

◆ Hemlock

Information on the frequency of failure of individual tree species during storm events should also be used to make tree-planting decisions and may be used to revise the city's/county's list of trees species recommended for planting in the community.

> ✓ **Record on the template whether or not your community has an official tree species list to guide tree species selection.**

# E. TREE REPLACEMENT PLAN

A small number of tree losses can be replaced during the next planting season. The preferred season for planting trees in North Carolina is October through April. Replacement planting for heavy tree losses should be spread over multiple years.

The number of public trees planted each year to replace losses will depend on the amount of resources available—budgets, donations, staff and volunteer time and labor and trees. Based upon the number of tree losses; the number of planting sites available, and the resources available on an annual basis, determine the number of years it will take to replace the trees lost and establish a goal of planting a specific number of trees per year over that time period.

The community should include in its public tree replacement plan a schedule for new tree maintenance to include, at a minimum:

◆ Mulching (annually);

◆ Irrigation (during the growing season—April through October—in the absence of adequate rainfall);

◆ Pest management (as insect and disease problems are identified);

◆ Young tree structural pruning (beginning the winter after the first growing season and annually as necessary), and

◆ Routine inspections (annually).

✓ **Record on the template whether or not your community has a written three-year maintenance plan for newly-planted trees.**

✓ **Record on the template the persons responsible for developing and coordinating the community's public tree replacement plan and for the maintenance of newly-planted trees.**

# F. TREE REPLACEMENT PARTNERS

Financial, labor and material assistance for large-scale and multi-year public tree replacement projects should be solicited from local companies, non-profit organizations and citizens. Some of these partners may already have been identified and have entered into a memorandum of understanding or advanced readiness contract for providing some of this assistance.

The tree care manager, storm mitigation team members and other community leaders should develop additional partnerships and solicit additional assistance to the level necessary for a successful replacement program.



- ✓ **Record on the template the person(s) responsible for soliciting financial, labor and material assistance for large-scale and multi-year tree replacement projects.**

- ✓ **Record on the template the names of program partners who could provide financial, labor and material assistance for tree replacement.**

# G. ONGOING TREE RISK MITIGATION

Tree risk should continue to be mitigated on an ongoing basis as described in the storm preparation section of this workbook. Tree risk mitigation should be a consideration in all community forest management activities, including replanting. Mitigation efforts during replanting and recovery should focus on tree health, tree pruning, tree and site selection, routine tree maintenance and tree protection.



- ✓ **Record on the template whether or not the community has an ongoing tree risk mitigation program and the activities included in that program.**

- ✓ **Record on the template the person responsible for coordinating ongoing tree risk mitigation.**

# H. INFORMATION AND EDUCATION

After short-term recovery and response has been completed, the community will continue to benefit from guidance on tree replanting, maintenance and mitigation efforts. With initial response and recovery completed, recognition programs for the response teams should also be a priority.

- ✓ **Indicate on the template whether or not your community has a program in place to identify the individuals, organizations and companies that deserve recognition for their storm response and recovery efforts.**

- ✓ **Record on the template the person responsible for coordinating the community's recognition program.**

During long-term recovery, the community's information and education program should continue and should focus on the following topics:

- ◆ Tree and tree canopy loss results

- ◆ Tree planting programs and grants

- ◆ Availability of assistance and materials, including volunteer labor, replacement trees, mulch

- ◆ When and how to hire an ISA Certified Arborist

- ◆ Ongoing tree-risk assessment

- ◆ Tree health maintenance

- ◆ Crown restoration pruning

- ◆ Recommended species for planting

- ◆ Tree planting techniques

- ◆ Tree benefits

  - ✓ **Record on the template the topics that will be the focus of a long-term recovery information and education program.**

The types of information and education programs during storm recovery may include:

◆ Recognition programs for responders

◆ Field demonstrations

◆ Neighborhood workshops

◆ Website content

◆ Newspaper articles

◆ Public service announcements

   ✓ **Record on the template the types of information and education programs that will be utilized for communicating with the public.**

# I. RECOVERY RECORD KEEPING

The maintenance of accurate records on community forest management and storm mitigation activities should continue during the recovery phase. These data and records will provide the basis for gaining additional program capacity and improving existing programs. They may also be helpful in securing grants for future mitigation projects.

◆ Staff hours;

◆ Volunteer hours;

◆ Equipment hours;

◆ Contractor invoices;

◆ Donations by source and donation value with contact information;

◆ Tree purchase data (nursery, number purchased by species and cultivar) and costs;

◆ Tree planting data (species, location, date) and costs, and

◆ Tree survival data (annual results).

   ✓ **Record on the template the types of records that will be maintained during long-term recovery.**

The person responsible for maintaining long-term recovery records will most likely be the tree care manager, but others may share that responsibility.

   ✓ **Record on the template the person responsible for maintaining long-term recovery records.**

# Notes:

# APPENDIX A.

## RESOURCES

The following documents, websites and presentations were either used as resources for the development of the *Community Forest Storm Damage Mitigation Plan Template* or are recommended for review by communities for storm damage mitigation planning:

Burban, Lisa L. (USDA Forest Service) & Andresen, John W. (University of Illinois). S*torms Over the Urban Forest: Planning, Responding and Regreening—A Community Guide to Natural Disaster Relief*, Second Edition, 1994, USDA Forest Service.

www.na.fs.fed.us/spfo/pubs/uf/sotuf/sotuf.htm

Burban, Lisa L. (USDA Forest Service), Hermann, Jim (Minneapolis Park and Recreation Board) & Himanga, Katie (Heartwood Forestry). *Tree Emergency Plan Worksheet*, Updated May 2006.

www.na.fs.fed.us/urban/inforesources

Department of Public Services, Columbus Consolidated Government. *Emergency Storm Response Plan*, publication date unknown.

Escobedo, Francisco, Northrop, Robert & Zipperer, Wayne. Developing an Urban Forest Management Plan for Hurricane-Prone Communities, Publication FOR121, University of Florida, Institute of Food and Agricultural Sciences Extension, September 2007.

http://hort.ifas.ufl.edu/woody/documents/FR176.pdf

Fazio, James R. *Helping Communities Recover in the Wake of Storms, ARBOR DAY*, September/October 2012, National Arbor Day Foundation.

www.arborday.org

FEMA Mitigation Planning.

www.fema.gov/multi-hazard-mitigation-planning

Hartel, Dudley R. *Storm Resources* (Slides with Notes 30 May 07), Storms Conference presentation, USDA Forest Service Southern Center for Urban Forestry Research & Information.

Pokorny, Jill D. (Coordinating Author). *Urban Tree Risk Management: A Community Guide to Program Design and Implementation*, USDA Forest Service, Northeastern Area, State and Private Forestry, Publication NA-TP-03-03.

http://na.fs.fed.us/spfo/pubs/uf/utrmm

Tree Care Industry Association, Inc. *ANSI A300 (Part 9)-2011 American National Standard for Tree Care Operations—Tree, Shrub and Other Woody Plant Management—Standard Practices (Tree Risk Assessment a. Tree Structure Assessment)*, 2011, Tree Care Industry Association, Inc.

Letson, Neil. *Making Our Urban Forests Safer, ANR1210*, Alabama Cooperative Extension Service, 2001.

www.aces.edu/pubs/docs/A/ANR-1210/index2.tmpl

Additional organizations, websites and publications that provide information on tree risk assessment, storm mitigation planning and community forest management are listed below.

## Ready NC

*Ready NC* is a statewide campaign supported by NCEM aimed at motivating residents to take action to prepare for a disaster. NCEM is the state agency that is responsible for emergency mitigation, preparedness, response, recovery and special events.

http://readync.org

## Citizen Corp Councils

www.citizencorps.fema.gov/cc/searchCouncil.do?submitByZip

## Community Emergency Response Teams (CERTs)

www.citizencorps.fema.gov/cc/searchCert.do?submitByZip

## Firewise Communities
www.firewise.org

## Storms Over the Urban Forest Toolkit (CD-ROM)

Copies of the CD may be obtained from:

Southern Center for Urban Forestry Research & Information
USDA Forest Service, 320 Green Street, Athens, GA 30602-2044
(706) 559-4236

**Other Resources**

In addition to the many websites and resources cited in the plan template, there are many other resources available on the Internet addressing tree risk, storm damage and storm mitigation. You can find these resources by searching using one of the following key phrases:

- ◆ Tree risk
- ◆ Tree damage
- ◆ Storm damage
- ◆ Storm mitigation
- ◆ Hazard mitigation

# NOTES:

*Community Forest Storm Mitigation Planning*

*– Restore Your Community –*

**North Carolina Forest Service**
1616 Mail Service Center
Raleigh, NC 27699-1600
Phone: 919.857.4801
**www.ncforestservice.gov**

This institution is an equal opportunity provider.