

# Disaster Recovery Steps to Maintain and Improve Urban Forest Resilience

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Considerable research demonstrates the broad range of ecosystem services (i.e., benefits) attributed to urban trees either individually or in groups as part of parks, natural areas, riparian buffers, in green stormwater infrastructure, along streets, and in other urban public landscapes. Environmental services contributed by urban trees include stormwater management, carbon sequestration, and impacts on human health that include air quality and lower urban temperatures (urban heat island mitigation).

Communities that adopt arboricultural standards and practices and implement comprehensive urban forest management can provide the long-term outlook needed to manage and maintain these environmental services. One component of this management is disaster response and recovery and this chapter will look specifically at a disaster response/recovery protocol that helps communities maintain viable and valuable urban tree canopy following destructive storm events.

The objective of this chapter is to introduce disaster planning, preparedness, response, and recovery utilizing professional arborists and urban foresters as a component of a comprehensively managed urban forest (i.e., community stewardship). It is intended to provide community groups, non-governmental organizations, civic leaders, and state and federal land and program managers with background on the Urban Forest Strike Team (UFST) disaster response and recovery program.

## **Community Preparedness, Vulnerability, and Typical Tree Damage**

Many communities have implemented tree management and monitoring programs, and adopted ordinances promoting urban tree protection and management. Important components of management programs include urban forest management plans that identify professional standards, adoption of best practices, detailed tree planting plans, and comprehensive urban forest risk management plans and practices. Monitoring efforts might include public tree inventories, public and private tree inventory sampling like i-Tree Eco or Urban Forest Inventory and Analysis (UFIA), and community-wide urban tree canopy (UTC) mapping and analysis. Urban forest management programs that promote healthy, diverse tree populations are integral to disaster preparedness.

Regardless of the level of urban forest management in a community, trees remain vulnerable to damage and loss from natural disasters that include high winds and ice storms. The resulting storm damage increases the immediate risk to residents and visitors in the community and in the long-term adversely affects production of environmental services. The purpose of urban forest management as a disaster planning tool is to improve overall

urban forest health, identify tree defects, assess risk, and prioritize mitigation that reduces storm impacts on the trees in the urban forest.

Extreme wind and ice events result in tree damage that is immediate and that requires mitigation to reduce risk to the public and begin the recovery of affected communities. It has been estimated that 80 percent of tree damage during natural disasters is associated with a preexisting defect (e.g., trunk decay and/or cavity, codominant stems, limb structure, damaged roots). Consequently, wind and ice events result in broken branches and limbs, split trunks, and toppled trees. UFST assessments for these types of disasters and damage can be made quickly and reliably and can be accomplished within the current Federal Emergency Management Agency (FEMA) timeline for public assistance.

While damage by flooding may include scoured trunks and toppled trees (particularly when accompanied by high winds), most damage will not become apparent for months after the flood event when trees begin to die or fail to leaf out from extended saturated soils. UFST assessments for these disasters are most effective in later stages of recovery and can still provide risk-based assessment of damaged and failing trees regardless of the status of FEMA public assistance.

Communities that maintain healthy trees, reduce tree defects and their associated risk with appropriate mitigation (i.e., pruning or removal), and have a protocol in place to respond and recover from disasters or extreme storm events will reduce short-term risk and be able to maintain a higher level of environmental services over the long-term by keeping damaged but viable trees. Communities are encouraged to include the urban tree resource and its professional management in local disaster plans.

## **Urban Forest Strike Teams, Urban Tree Canopy, and Post-Disaster Objectives**

Urban forest strike teams (UFSTs) are a disaster response and recovery project that is supported by the Southern Group of State Foresters and the Northeast-Midwest State Foresters Alliance and their respective state urban and community forestry (UCF) programs. The urban forestry program of the USDA Forest Service provides technical assistance and organizational support for UFSTs from Athens, GA, and Durham, NH (Figure 1). UFSTs are composed of state forestry agency certified arborists and urban foresters, municipal arborists, extension foresters, and tree wardens trained to make urban tree risk and damage assessments following natural disasters (i.e., wind events, ice storms). UFSTs have not been implemented in the western United States primarily because typical storm events and natural disasters (i.e., fire, floods, landslides) more often result in tree loss rather than damage. However, the

# Urban Forest Strike Team

As part of the Hurricane Gustav disaster response, experienced professional arborists from throughout the South are assessing storm-damaged trees along the public right-of-way to facilitate your local recovery.

They are working in cooperation with the Louisiana Department of Agriculture & Forestry, the City of Baton Rouge, BREC, and USDA Forest Service.

Figure 1: Urban forest strike teams vehicle signage.

UFST rapid assessment protocol could possibly be adopted for management and response to other disturbances of urban trees. The primary objectives of UFSTs include:

- Assistance to communities that do not have the professional capacity to manage the trees affected by the disaster
- Immediate and short-term risk management
- Retention of viable tree canopy and associated environmental services
- Compliance with FEMA criteria for reimbursement under public assistance

UFSTs provide rapid tree risk assessments to identify the risk that storm-damaged trees pose to people and property on publicly managed land (e.g., parks, streets and other rights-of-way, and around public buildings), support FEMA public assistance and are the basis for professional recommendations for short-term risk mitigation.

UFSTs provide professional response and recovery services to communities following ice storms, hurricanes, and other natural disasters. Resource deployment is commensurate with the scale and intensity of the event and therefore may occur at the local, state, or regional level.

Deployment for risk assessment and debris classification typically occurs in the late stages of disaster response or early stages of disaster recovery before debris removal operations have been completed. In later stages of disaster recovery, UFSTs may assist by identifying appropriate planting sites and species to restore environmental services destroyed by the disaster.



Figure 2: UFST crew discusses tree damage along city street.

Photo by Dudley Hartel, USDA Forest Service.

UFST deployment is merely one component of a comprehensive urban forest management strategy that ideally includes urban forest risk management and inclusion of urban trees and professional management of those trees in local disaster plans.

## Urban Forest Strike Team Overview

The UFST initiative involves recruiting, training, and deploying professional urban foresters and arborists (required to have basic incident command system [ICS] training, and arboricultural certification or experience) to assess tree damage using FEMA criteria and tree risk management standards. Strike team members attend a multi-day training workshop and obtain continuing education via webinar, e-learning, and/or state sponsored disaster training scenarios (i.e., disaster exercises).

As UFST personnel (i.e., task specialists) gain disaster experience they are eligible for advanced training and promotion to team leader status. A typical deployed “team” includes two team leaders and 10 task specialists (i.e., five crews) with geographic information system (GIS) and communications support.

UFSTs evaluate individual trees, street by street, along trails, and in parks within a defined disaster area to assess storm damaged trees on public property and rights-of-ways to identify risk and recommend removal or pruning mitigation, and qualification for FEMA debris reimbursement under their public assistance program. Maps and data sheets are provided to the community to help them document debris for FEMA, plan the work needed, effectively contract for debris cleanup, document the cost of the damage,

schedule additional post-disaster risk assessment, and prepare for additional restoration and mitigation pruning during long-term recovery (Figure 2).

The teams may also provide technical assistance with debris estimation during the initial response phase of a disaster, and support for longer term risk assessment and tree planting recovery efforts.

Protocols and services provided by UFSTs follow national disaster policy, FEMA guidelines, and current arboricultural standards:

- Tree risk assessment (Tree Care Industry Association 2011)
- Best management practices (Smiley et al. 2012)
- FEMA public assistance program and policy guide (FEMA, various dates)

## The Deployment Framework for Urban Forest Strike Teams

Municipalities typically request UFST assistance with disaster response and/or recovery through their local (municipality or county) emergency manager, state UCF coordinator, or state forester. Assisted by the state UCF coordinator, the municipalities are responsible for identifying and prioritizing areas for debris estimation and public property tree risk assessments (Figure 3). The state UCF coordinator is responsible for coordinating disaster recovery resources throughout the state when natural disasters are geographically extensive (i.e., significant impact in multiple communities). This community or state-based (i.e., bottom up) approach to disaster response is in keeping with FEMA's overall objectives for disaster planning at the local and state level.

A good fit for the process and UFST response might be a community situation where:

1. There is **significant damage** to public trees in a community.
2. The damage is such that the **community finds it challenging** to decide which storm-damaged trees meet FEMA debris standards or represent a significant risk to the public.
3. The footprint of the **damage area is concise** enough that a team could work efficiently.
4. The **community may not have staff with technical tree expertise**,

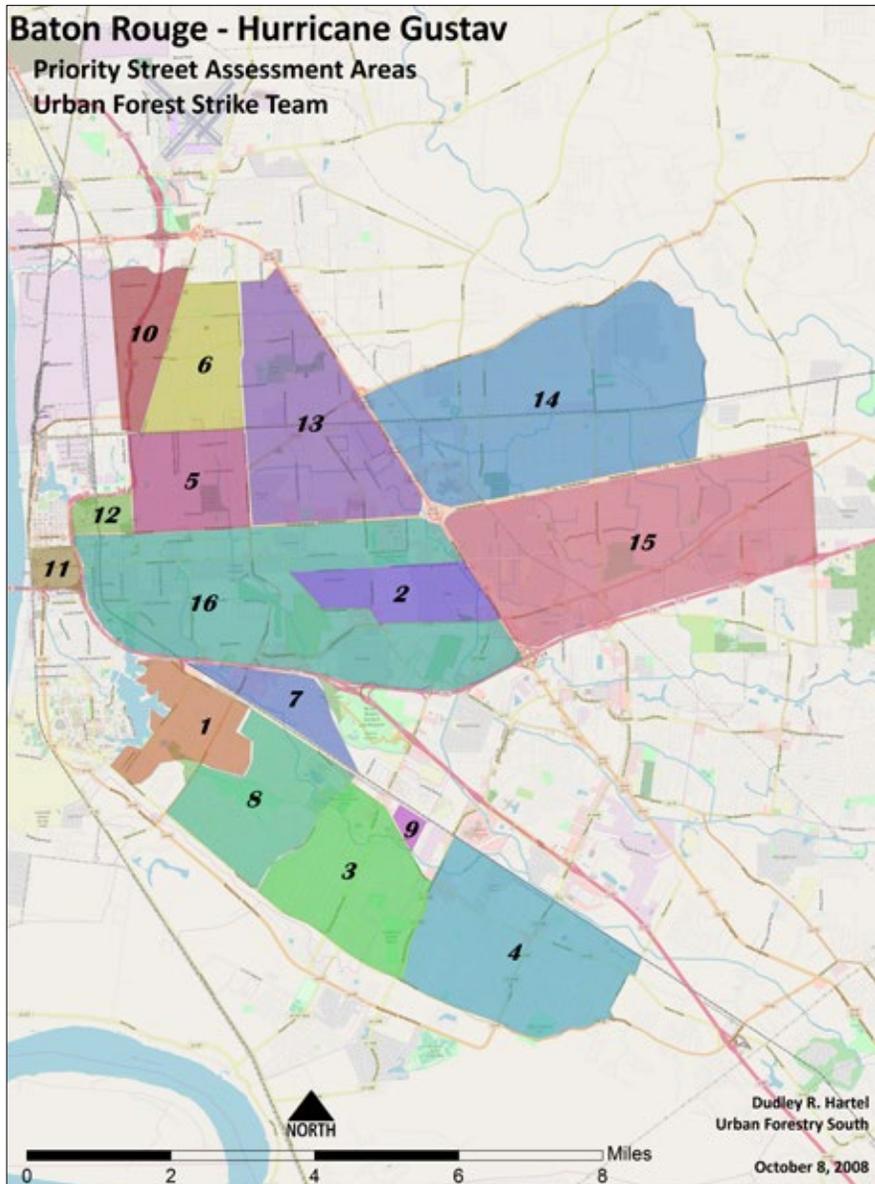


Figure 3: Baton Rouge (LA) storm damage prioritization map for UFST deployment.

Photo by Dudley Hartel, USDA Forest Service.

or their staff may not have the time to do tree assessments because of the scale of the disaster or other disaster-related assignments.

5. The **community has the capacity** to use and follow up on recommendations.

a. Information compiled by the teams can be used immediately for FEMA documentation and in contracting for debris removal.

b. Information can be used during long-term recovery for follow-up mitigation, restoration pruning, and tree health and risk assessments.

UFST have successfully worked with communities, State emergency management personnel, FEMA debris managers, and disaster management consultants to meet requirements of the response and recovery process during the past 10 years of operation.

UFST currently uses ArcGIS Online (AGOL; Esri, Redlands, CA) with real-time reporting (assuming cell coverage is available) which enables the city arborist, local emergency management, and UFST team leaders to monitor progress and storm damaged areas worked. Most state and local emergency management agencies have adopted ArcGIS Online as their geographic information system for managing disasters.

## Urban Forest Strike Team Activities

UFST has responded to more than 21 disasters in 14 states in the eastern United States since its inception. Local communities, FEMA regional debris managers, and disaster management consultants have directly benefited from UFST assessments, data collection, and risk/damage reports developed for their use within FEMA public assistance. Deployments have ranged from multiple teams to single UFST crews. UFST currently has more than 250 task specialists and 30 team leaders trained (eastern U.S.).

UFST training workshops have been held every year across the eastern United States. This training also includes disaster exercises to maintain UFST readiness, improve the assessment protocol, and further develop the data collection and reporting system.

State forestry agencies in the southeastern United States have developed workable interstate deployment with the publication of mission ready packages. When regional support is needed, states and communities are

being encouraged to use the national mutual aid agreement and partnership Emergency Management Assistance Compact (EMAC) to support interstate deployments with the necessary legal and financial support to UFST resources. EMAC's strength lies in the relationships among federal organizations, states, counties, territories, and regions; and the ability to move just about any resource, including UFST, from one state to another.

The UFST program and protocols have undergone improvement throughout the 10-year history but continue to use the incident command system (ICS) model including prerequisites and training standards, and an operational mode at the state level (initiated by the state UCF coordinator and state forester). Also during that time, protocols and equipment have been continuously updated based on after action reviews, availability of new technology, and modified professional standards. UFST uses a risk-based approach based on the current arboricultural standards and best management practices (BMP). UFST was initially developed to provide resources at a regional level but the program has evolved to place emphasis at the local, county, and state levels which can be less expensive, more responsive, adaptable to a wider range of storms and damage, and to a wide range of community needs.

## **Urban Forest Strike Teams Support Communities**

UFST provides an unbiased, third-party assessment of damage to trees from natural disasters with the primary objective of retaining as much viable and productive tree canopy as possible within the criteria used by FEMA's public assistance program and compatible with community goals, objectives, and management strategies. UFST can take community species (e.g., live oak, bald cypress, magnolia) and spatial priorities (e.g. maintain trees in specified neighborhoods or parks) into consideration to override allowable FEMA assistance. The results can include the following data and reports:

- FEMA tree removal list—can be prioritized by risk rating
- FEMA tree limb removal list—can be prioritized by risk rating
- FEMA stump list
- Mitigation that identifies local community priorities
  - Trees with residual defect—for post-recovery management.During later stages of recovery and outside of the FEMA reimbursement process, UFST may assist with evaluations to support additional stewardship activities:

- Follow-up tree risk assessments (Level 1)—12-18 months following the event
- Tree species selection based on prior disaster response (i.e., data analysis)
- Planting site evaluations to support long-term viability and productivity

## Conclusions—What We've Learned

UFSTs can deploy quickly during late response and early recovery following natural disasters to help communities manage debris and maintain important, viable trees in their urban forest. The UFST role is to supplement and complement local resources that may be limited depending on the scale and intensity of the storm event. UFSTs are professional foresters and arborists grounded in incident management, tree risk assessment, and FEMA guidelines who operate independently from the community and the debris management process which makes for acceptance across the disaster management spectrum (i.e., community, city managers, disaster consultants, debris contractors, FEMA). UFSTs are an important component of an urban forest and disaster management programs.

Regardless of the level of urban forest management or the degree of disaster preparedness, urban trees will be damaged during storm events. Prestorm mitigation (i.e., pruning and removing trees with defect that represent unacceptable risk) can take place within the community's urban forestry or their disaster planning and preparedness programs. Addressing and identifying this mitigation in both, as collaborative or supporting plans, may help a community see the connection between their urban forest management and their preparation for disasters.

Regardless of the source of the mitigation, we know that a defective tree removed or a defective limb pruned cannot fail during any successive storm event. Anecdotally and with less certainty, we also observe that healthy, structurally sound trees of appropriate species growing on suitable sites will typically withstand greater storm impacts with lower levels of tree damage. These healthy, structurally sound trees of appropriate species growing on suitable sites are often the result of adoption and use of arboricultural standards and best practices, at some minimal level, that are used throughout the tree's life-cycle within a directed urban forest management program.

## Case Study

# Baton Rouge, Louisiana<sup>1</sup>

Hurricane Gustav, a Category 2 major hurricane, made landfall at Cocodrie, LA, with wind speeds at 105 miles per hour on September 1, 2008. While the hurricane quickly weakened to a tropical storm as it crossed southern and western Louisiana (wind speeds at 60 mph), it caused major wind damage to trees in Baton Rouge. Heavy rains preceded the hurricane and the winds caused significant wind-thrown trees in addition to more common broken limbs and branches from direct wind impact.

This case study illustrates the collaborative nature of the state forestry agencies, municipalities, and USDA Forest Service in mobilizing UFST commensurate with the scale of the disaster and the needs of the community. Specifically it illustrates the use of an UFST and the deployment of successive teams to provide tree risk assessment and FEMA public assistance support.

### Request for Assistance

The Baton Rouge city arborist, Steve Shurtz, describing this as “worst storm to have hit Baton Rouge in 100 years” made initial contact with the Louisiana Department of Agriculture and Forestry (Mahlon Doucet, UCF Coordinator and Wade Dubea, State Forester) to make a formal request for assistance.

Leslie Moorman (North Carolina), Paul Revell (Virginia), and Barbara White (Virginia)

1. Excerpted from USFT Hurricane Gustav daily blog. See Literature Cited.

began preparations for the deployment of UFST (two teams) to assist with street tree risk assessment in Baton Rouge (Louisiana) and other communities in that area that were hit by Hurricane Gustav. In Louisiana, Mahlon Doucet and Tom Campbell (UCF Partnership Coordinator) contacted other nearby communities that were active with the state UCF program to determine if additional UFST support was needed.

The plan called for the first team to arrive during the week of September 21; the second team was to arrive on September 30 and work through October 11th. Urban Forestry South (USDA Forest Service, Athens, GA) provided technical assistance.

### UFST Deployment

The first team (four crews) deployed on September 22 and included task specialists from Arkansas, Georgia, North Carolina, and Virginia. Paul Revell, Virginia Department of Forestry (VDOF) was team leader and assisted by Urban Forestry South. The Louisiana Department of Agriculture and Forestry (LDAF) provided an incident response office at their offices in central Baton Rouge, and GIS and communications specialists to assist UFST during the deployment.

A neighborhood near the incident office was selected for a quick refresher training for the crews, equipment checks, review of disaster specific safety issues, and community context

discussion (i.e., keep “all” live oaks), led by the city arborist, Steve Shurtz. During that first day, UFST also made contact with Baton Rouge Recreation (BREC) and determined that they also needed immediate assistance in major city parks.

The second team (arriving October 1) included five crews from Georgia, North Carolina, and Virginia, and were led by David Stone (VDOF) and Doug White (NC Forest Service). Urban Forestry South continued to provide technical assistance.

Operating under ICS protocol, Paul Revell and the UFST “first team” crews briefed the incoming team leaders and crews on tree damage, crew safety, and community issues.

### **Working in the Community**

The UFST team leader and LDAF worked with the city arborist on reconnaissance of the known storm damaged area to develop a prioritization map (See Figure 3). BREC parks were also included in this area prioritization process. The prioritization was reassessed when the second team arrived in Baton Rouge.

UFST crews carried identification and signage (See Figure 1) that introduced them to the community as they worked along city streets and in parks. LDAF communications handled news media contacts and arranged for UFST interviews as needed with local print and television outlets.

### **Support to Community and Debris Contractors**

After review, raw data collected during the UFST deployment was turned over to the city and BREC daily and detailed street maps were produced about every 5 days to assist debris contractors with pruning and tree removal mitigation. A final tabulation of data was prepared for the city to support documentation for FEMA public assistance.

### **Final Statistics**

Street miles: 500

Street trees assessed: 5,498

Park trees: 1,882

Stumps: 208

## Recommendations to Communities

Local communities working with their state forestry agency's urban and community forestry (UCF) program can participate in the UFST initiative at various levels. At the highest level, communities can develop in-house capacity in the UFST protocol by participating in training that is conducted annually throughout the eastern United States. This approach provides an increased understanding of disaster deployment and the assessment protocol to support mitigation, and can be further supported by local adoption of BMPs for urban tree risk management which may include the tree risk assessment qualification available through the International Society of Arboriculture. At the lowest level, communities can develop a closer working relationship with the state UCF Coordinator and participate in programs to expand local urban forest management to include an understanding of the UFST disaster deployment objectives and mechanism.

As a member of a local community group, nongovernmental organizations, or in your role as a civic leader, what steps might be taken to incorporate the UFST protocol into local planning, response, and recovery for disasters?

Consider:

- Becoming more knowledgeable of your state's urban and community forestry program
  - The state forestry agency's program and staff
  - Your regional or statewide urban forest council
  
- Becoming more knowledgeable of and involved with your community's urban forestry program
  - Staff
  - Plans, standards, and practices
  - Urban tree/forest risk management
  - Funding
  - Local tree board
  - Other partnerships
  
- Request your state forestry agency participation in UFST
  - As trained UFST members
  - To recruit municipal and consulting arborists into the program
  
- When talking to elected officials, explain the value of urban forests and disaster planning
  
- Participating in local disaster planning

- Present professional urban forestry within context of natural disasters
- Participating in local comprehensive planning efforts
  - For urban forest management
  - For disaster planning that includes urban forestry and response/recovery activities of UFST

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### Other References

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UFST 1 minute video: <https://www.dropbox.com/s/9mx1o03vt1xn7c9/UFST%201%20Minute.mov?dl=0>

Urban forest strike team: <https://www.ufst.org/>

UFST workflow and relationships: [https://ufst.org/resources/library/ufst-deployment-event-workflow/at\\_download/file](https://ufst.org/resources/library/ufst-deployment-event-workflow/at_download/file)

Using UFST data: [https://www.ufst.org/resources/library/ufst-tree-risk-and-data-uses/at\\_download/file](https://www.ufst.org/resources/library/ufst-tree-risk-and-data-uses/at_download/file)

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