Trees as Community Green Infrastructure

Introduction
Before, during, and after natural disasters a community must maintain infrastructure systems to ensure safe and accessible public rights of way, water, electric, communications, and sanitation services. Trees and urban forests are a component of public (green) infrastructure, providing ecosystem services and human benefits that should be a critical consideration in efficient and effective mitigation, response and recovery efforts. This briefing paper will offer recommended best practices that will reduce debris loading, sustain green infrastructure service delivery, and speed community recovery.

Background
Within FEMA Public Assistance guidance, the National Response Framework and the National Disaster Recovery Framework, trees in communities are primarily addressed as debris, either standing or on the ground. Recovery Policy 9524.5 authorizes restoration of trees when identified as contributors to critical facilities for stabilizing slopes, erosion control, minimizing sediment runoff, and wetland or endangered species habitat restoration. In terms of emergency management, trees are often viewed as a costly problem that slows response and recovery. To community residents however, trees define the place. A physical landscape leveled and torn by natural disaster is devastating emotionally to residents, and that sense of loss affects the mood and pace of recovery.

Cities and towns have been planting and maintaining trees and urban forests over the decades as basic infrastructure that supports environmental quality, human benefits, and long-term community growth and prosperity. The USDA Forest Service supports a program of technical and financial assistance through State Forestry Agencies to local government to enhance and sustain community tree cover on public and private property. Planting and maintaining trees in urban settings is a green infrastructure practice with multiple benefits for resilience, adaptation, human health, and climate mitigation. From Forest Service research, a typical medium-sized tree can intercept as much as 2,380 gallons of rainfall per year. In addition to intercepting and filtering stormwater runoff to prevent flooding and improve water quality, trees also contribute to adaptation by reducing surface temperatures through shading and evaporation and reduce risk of skin cancer due to exposure, and have many other public health benefits. As a biogenic utility, trees also absorb pollutants to clean the air, reduce energy consumption for cooling and heating, and store carbon dioxide.

During most storms, with winds below 40 mph, or during seasonal ice and snow storms, trees with good structure and in good condition are a net benefit, moderating climate extremes. In heavier winds and snow or ice loading during active growing seasons, tree structure and condition become a critical concern.

Discussion:
Community trees are physical assets that are installed and maintained by residents and local governments for specific purposes and provision of ecosystem services. Advanced communities have complete inventories, set tree canopy goals, and develop management plans to sustain trees in healthy condition. They retain qualified arborists for day-to-day and long term management, and have integrated trees and green infrastructure within their comprehensive plans and regulatory actions to control storm water and improve public health, safety and welfare. While always considered to be natural resources, they are managed as infrastructure.

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Mitigation practices in advance of storms include annual inspections, structural pruning, selective removal, and planting site-appropriate trees based on tree species, condition, and location, thus reducing potential risk to property, public rights-of-way, continuous delivery of utility services, and public safety. Specific considerations include:

1. Tree Risk Mitigation Planning at the Community Scale
   Tree inventory, assessment, and prioritization of high risk areas (e.g., roadways, public use and occupancy patterns, and mature canopy areas), systematic level 1 and level 2 tree risk assessments per ANSI A-300 Section 9, and statement of policy

2. Tree Emergency Management Planning
   Specific guidance to community employees on priority actions and processes that will ensure safe, continuing operations before, during, and after storms

3. Debris Estimation and Management/Utilization Practices
   Processes for estimating and validating debris with emergency management personnel, and agreements for staging areas to ensure debris and wood residue is managed for its highest and best use

4. Arborist Qualifications for Tree Risk Assessment/Validation
   Specifications for contracting and oversight of tree risk assessors (ISA Tree Risk Assessment Qualification) during emergency response and recovery operations, separate from pruning and removal contractors.

5. Tree Risk Assessment and Mitigation Best Practices
   Application of ISA Risk Assessment BMP that favor retention of trees with low probability of risk to public safety and high probability of recovery

Proposed Actions for Planners:

1. Prepare guidance for tree risk mitigation and management to build infrastructure resiliency
2. Establish standards and specifications for contracting qualified arborists or requesting State/Federal Urban Forest Strike Teams for Risk Assessment/Validation/Mitigation following natural disasters
3. Identify staging areas and develop protocols and opportunities for the highest and best use of woody debris
4. Prepare facility descriptions and agreements that include trees as critical and integrated components.

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