

# 2019 National Urban and Community Forestry Grant Proposals

## Grant Category

### National Ten Year Urban and Community Forestry Action Plan: Research Needs - **D: Prepare for Pests, Threats, Natural Disasters and Associated Changes and Risks**

Projects in this category should increase knowledge about, or understanding of, how to address the abrupt changes and threats to our communities and their forests. Threats that can transcend their local forest system, such as, hurricane or tornado, damage that impacts all community infrastructure systems and threats that are more tree focused impacting the health and productivity of the forests, such as an insect pest or virulent disease.

Research, studies, technology, and, policy are needed to better understand and monitor current threats, to diminish tree loss, maintain forest health, and to sustain a community's forest ecological services. Studies are also needed to help anticipate emergent threats or negative conditions to enable proactive management response to protect these services our forests provide in improving a community's health and human well-being.

## Background/Intent

Towns, cities and regions are encouraged to conduct tree canopy assessments or tree inventories, set community forest goals and policies, and adopt management plans to promote consistent, stable forest management programs. Yet ever more communities are experiencing abrupt changes and threats. Some change transcends their local forest system, such as, hurricane or tornado damage that impacts all community infrastructure systems, including their forests. National Assessments have summarized the impacts of natural disasters in the United States, now and in the future, and identify the wide-ranging changes and threats for all communities, including natural infrastructure resources.

Other changes are tree-focused, threatening the health or productivity of the forest, such as an insect pest or virulent disease. Some threats are abrupt, showing consequences in hours or days, and others simmer for years with gradual implications (such as invasive plant species).

Research, studies, technology, and, policy are needed to better understand and monitor current threats, to diminish tree loss, maintain forest health, and to sustain a community's forest ecological services. Studies are also needed to help anticipate emergent threats or negative conditions to enable proactive management response.

Proposals may include, but are not limited to, networks of diverse communities and scientists that will integrate threats such as flooding, extreme heat, and, drought. Finally, social or policy studies can help to reveal the institutional best practices that can be put in place for threat prevention, response, and citizen engagement for forest and community sustainability. Subject matter should focus on one or more of the following:

## Emergent Objectives

Given likely increase of in invasive species and extreme weather events, effort is needed to better understand and work within change trending to anticipate and integrate Urban and Community Forestry Goals with likely futures, and study of vulnerable situations (such as found in the decimation of Ash and western pine forests) can provide insight for broader patterns and responses.

- Continue and expand studies of natural disasters and urban and community forest ecosystems implications to develop stakeholder awareness, better prioritized community response, policy and programs. That leads to a community's resiliency to such negative events.
- Clearly define and describe, then quantify urban forest threats and impacts from national to local scales, to include invasive plant species, insect pest invasions, land use development, city/town wildfire, and weather/natural disaster scenarios.
- Create models and decision tools to support community and urban threat forecasting and management response, including trade-offs analysis for policy and budget scenarios.
- Use current and new evidence to construct best practices for tree/forest/ecosystem threat planning and management. Correlate these best practices and threat impacts to a community's socio and economic impacts.
- Communicate and educate our citizens of these threats and their impact of the economic, environmental and community well-being.

The National Urban and Community Forestry Advisory Council Recommendation to the USDA Forest Service the following grant proposals in ranked order:

1. Mapping High Priority Tree Species Through Cost-effective Frameworks by Integrating Airborne LiDAR and Satellite High Spatial Resolution Imagery
2. A 21<sup>st</sup> Century Approach to Coping with Emerging Tree Diseases in Community Forests
3. Forecasting High-impact Insect Invasions by Integrating Probability Models with i-Tree From Urban to Continental Scales
4. The Accessible Urban Tree Inventory: Expanding State Capacity for Planning and Risk Management
5. A City Plagued: Leveraging Multiple Risks for Insightful Preparation and Response

1. Mapping High Priority Tree Species Through Cost-effective Frameworks by Integrating Airborne LiDAR and Satellite High Spatial Resolution Imagery

Wai Lee, Executive Director, Smart Trees Pacific, Kailua, HI

**Abstract**

There is a critical need for a methodology to improve efficiency and reduce the cost of collecting tree inventories in time for urban forest managers to effectively respond to threats. Smart Trees Pacific, an urban forestry non-profit in Hawaii, and Dr. Qi Chen, a remote sensing and environmental geography scientist at the University of Hawaii, are partnering to develop a methodology to map high priority tree species by integrating airborne LiDAR and satellite high spatial resolution imagery. Our proposal offers a cost-effective and innovative approach to mapping urban forest threats with remote sensing data to address NUCFAC's priority issue "Prepare for Pests, Threats, Natural Disasters and Associated Changes and Risks." Dr. Chen and a graduate research assistant will research methods to integrate the publicly available data to detect individual trees and refine machine learning algorithms to identify high priority species. Smart Trees Pacific will use their tree mapping expertise to assist with ground truthing their results. They will also conduct a national outreach campaign to disseminate results and share technology with target audiences, including researchers and urban forest managers. Disadvantaged and isolated communities would be particularly benefit from this methodology as they are often more vulnerable to urban forest threats and do not have access to resources to conduct traditional tree inventories.

2. A 21<sup>st</sup> Century Approach to Coping with Emerging Tree Diseases in Community Forests

Dr. Pierluigi Bonello, The Ohio State University, Columbus, OH

**Abstract**

When forests in urban communities come under attack from emerging invasive pathogens, managers are almost always at a loss on what to do. Following extended periods of trial and error, oftentimes managers give up the fight after having spent large sums of money and having deployed extensive human resources on unproven strategies, eventually resorting to tree removal and replanting with different species. We posit that modern technology can give us a better approach to dealing with these recalcitrant problems. Thus, our main goal is to develop a modern, generalizable protocol/strategy for rapid assessment and response to emerging tree diseases in urban forests that combines both rapid and robust diagnosis with rapid and robust surveillance and monitoring. This will be achieved through next generation sequencing and spectrometric detection of tree diseases. The protocol will be tested on two emerging tree diseases of currently unknown etiology. Our general approach will allow for the formulation of rational management strategies, including, critically, the eventual selection of resistant tree germplasm for subsequent propagation, breeding, and out planting. In essence we will provide a ready-made roadmap so that communities everywhere across the country can deal effectively with alien tree pathogens.

3. Forecasting High-impact Insect Invasions by Integrating Probability Models with i-Tree from Urban to Continental Scales

Ruth Hufbauer, Colorado State University, Department of Bioagricultural Sciences and Pest Management, Fort Collins, CO

**Abstract**

Invasive insects pose ongoing threats to urban, community, and natural forests and their ecosystem services. We propose to develop tools that identify non-native insects with potential to cause tree mortality in the U.S. should they establish here, and assess their potential environmental and economic impacts. Specifically, we will: (1) develop a generalized insect pest impact model that predicts which non-native insects have high probability of causing tree mortality in the U.S.; (2) integrate model predictions with i-Tree modules so users can analyze urban forest inventories (i-Tree Eco) and FIA data (i-Tree Landscape) to generate geographically-specific risk and economic impact assessments from local to continental scales based on vulnerability of tree species and impacts on their ecosystem services; and (3) develop a broad-based technology transfer and outreach program to extend these tools to stakeholders, including an i-Tree App (Pest Risk) that projects the potential impacts of newly discovered non- native insects on urban forests. Integration of these products within the well-established and supported i-Tree platform will ensure long-term sustainability of the project, including access, maintenance, user support, and enhancements. The products and outcomes of this project will enhance the resilience of U.S. urban, community, and natural forests.

4. The Accessible Urban Tree Inventory: Expanding State Capacity for Planning and Risk Management

Kathryn Fernholz Dovetail Partners, Minneapolis, MN

**Abstract**

Managing the urban forest in the face of the challenges and risks associated with increasing threats requires specific information about individual trees in that urban forest. Urban tree inventories have been an essential management tool, and now being prepared for risks and changes from pests or natural disasters means inventories are more important than ever. Accessibility to affordable inventory tools is essential.

This project will provide access to an inventory program with a standardized interface, specialized and data fields, customizable fields for local planning needs, all available at low cost through all state urban forestry (UF) program coordinators. With training and technical support, this tool provides the ability to assist communities, identify state concerns and risk using real data from communities of all sizes, and communicate effectively to all stakeholders including state and federal legislators. This project will pilot, test, train and release the program across the country.

The project would also provide a national template, refining an existing forest storm mitigation planning tool, developed by Georgia to be used in conjunction with outreach to communities, to increase the awareness of urban tree management and the importance of including trees in the emergency management process. (See Virginia's graphically designed version at this link:

[http://dof.virginia.gov/infopubs/Comm-Forest-Storm-Mit-Plan-Workbook\\_pub.pdf](http://dof.virginia.gov/infopubs/Comm-Forest-Storm-Mit-Plan-Workbook_pub.pdf).)

5. A City Plagued: Leveraging Multiple Risks for Insightful Preparation and Response  
Becky Cupit, Texas A&M Forest Service, College Station, TX

### Abstract

Numerous cities across the United States have experienced catastrophic flooding in the past several years. The implementation of Urban Forest Inventory & Analysis (FIA) in Houston in 2015 provides a unique opportunity to explore the effects of Hurricane Harvey. Flood risk, though, is only one of the issues facing Houston. Invasive species (Chinese tallow), insect/disease (emerald ash borer), air pollution, and urban heat island also pose risks for the city. Urban FIA data collected before and after Hurricane Harvey will be analyzed to determine the effects of flooding on Houston's trees. Special focus will be on Chinese tallow and ash to identify opportunities for multiple-objective management planning. Effects will also be investigated to see if socioeconomic groups were affected similarly and identify efforts that can be taken to improve environmental equity. The results will be used to develop recommendations for planting trees strategically to mitigate the risk of flood damage, invasive species, insects/disease, and air quality while cultivating environmental equity. Recommendations will be accompanied by innovative technology to communicate the effects of implementation. Partner networks will be leveraged to effectively disseminate the information. It will be of immediate use for Houston recovery efforts and can be translated to other areas.