PROPOSAL TEMPLATE

Forest Service use only.

Control Number: _____

COVER SHEET

2014 U.S. Forest Service

National Urban and Community Forestry Challenge Cost-Share Grant Program

Proposals are due by April 29, 2014, 11:59 PM Eastern

INNOVATION GRANT CATEGORY:

(An estimated total amount of $900,000, may be available, approximately $300,000 per category)

Check one category per application. More than one application may be submitted by an organization.

- ☐ Category 1: Making Urban Trees and Forests More Resilient to the Impacts of Natural Disasters and the Long-term Impacts of Climate Change
- ☐ Category 2: Green Infrastructure Jobs Analysis
- ☐ **X Category 3: Utilizing Green Infrastructure to Manage and Mitigate Stormwater to Improve Water Quality**

PROJECT CONTACT NAME, ORGANIZATION, ADDRESS, PHONE NUMBER, FAX NUMBER AND EMAIL ADDRESS:

University of South Florida
Dr. Kalanithy Vairavamoorthy (PI)
Ms. Sara Labadie (Administrative Contact)
3702 Spectrum Blvd. Suite 165
Tampa FL, 33612

PROJECT TITLE:

From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management

FUNDING REQUEST AND MATCH (Note: Matching amount must at a minimum equal requested amount.)

REQUESTED: $ 149,722+ **MATCHING: $** 155.612 **= TOTAL PROJECT: $ 305,334**

OUTREACH

Note: if one check "Yes" in either of the boxes below, the applicant will be required to describe either how they plan to outreach to the identified population and/or provide a description of your underserved organization.

Is this project being developed to reach a minority or underserved population? ___Yes __X_No

Is this pre-proposal being submitted by a minority or underserved population (owned/operated/directed) business, organization or college/university? ___Yes _X__No

Applicants should also address how the issue impacts underserved communities and how the proposal can address or minimize these impacts when applicable.

ABSTRACT

Many cities recognize the potential of green infrastructure in managing and mitigating urban stormwater runoff (e.g. nutrient load), yet most lack systematic strategies for transitioning away from their existing conventional (gray) drainage systems. This project is intended to provide natural resource managers, planners, and engineers with decision support tools to aid the strategic planning process for transitioning to green infrastructure systems that emphasize trees and urban forests. First, a GIS-based mapping tool will help users identify areas suitable for green infrastructure, factoring in site conditions and existing drainage systems. Second, an optimization tool will help users identify an optimal mix of existing gray and new green infrastructure. A final decision support tool will help users select the preferred combination of gray and green options, given site constraints, water quality objectives, and key secondary social and ecological benefits of trees and urban forests (e.g. shade, heat-island mitigation, noise abatement). When used in combination, the proposed toolset will identify a prioritized, optimal transition pathway from gray to green infrastructure. The entire suite of tools will be supplemented with supporting documentation, including case studies in Tampa and Hillsborough County (Florida) and Milwaukee (Wisconsin).

PARTNERS AND STAKEHOLDERS

Several project partners have agreed to contribute valuable time and/or resources to ensure the success of the proposed project. In addition, stakeholders have expressed their support for the project and included reference to specific ways the results will benefit them and their communities. The following lists of the project partners and stakeholders include contact information and a brief summary of their role in the project.

PROJECT PARTNERS:

1. Thomas L. Singleton, President, Thomas L. Singleton Consulting, Inc; 285 Taylor Road, Monticello, FL 32344; 850-556-9733; Tom@TLSingletonConsulting.com. Letter included. Mr. Singleton is a core part of the project team. He has assisted with proposal development and will assist with all aspects of the project oversight. He will support the development of the decision-support prioritization tool and the testing of the complete toolset in the Tampa, Hillsborough County, Florida, and Milwaukee, Wisconsin case studies. He is listed as a partner because he will not require federal funds to support his salary. He is providing 192 hours ($28,800) of his time as a cost-share.
2. Rob Northrop, Extension Forester, Urban and Community Forestry, University of Florida/ Hillsborough Co. Extension; 5339 County Road 579, Seffner, Florida 33584; 813-744-5519 x54106; northrop@ufl.edu. Letter included. Mr. Northrop is a core part of the project team. He has assisted with proposal development and will assist with all aspects of the project oversight. In particular, he will be actively involved in the organization and facilitation of the Project Advisory Committee, development and testing of reference documents, user-manual and training modules, and the teaching of workshops. His is listed as a partner because he will not require federal funds to support his salary. He is providing approximately 220 hours ($7,000) of his time as a cost-share.
3. Charlie Marcus, Urban Forestry Coordinator, Florida Forest Service; Florida Department of Agriculture and Consumer Services, The Conner Building, 3125 Conner Boulevard, Tallahassee, FL 32399-1650; 850-921-0300; charles.marcus@freshfromflorida.com. Letter included. Mr. Marcus has agreed to volunteer at least 10 hours (for cost-share purposes) to assist with the project. He will participate on the Project Advisory Committee to help ensure that the project results will benefit urban and community forest management.
4. David Glicksberg, P.G., Manager, Environmental Services Section; Engineering and Environmental Services Division; Hillsborough County Public Works Department, Post Office Box 1110, Tampa, FL 33601; 813.744.5671 ext. 247; glicksbergd@hillsboroughcounty.org. Letter included. Mr. Glicksberg has agreed for his staff to participate on the Project Advisory Committee and assist with testing the toolset in Hillsborough County, Florida. He has volunteered at least 15 hours for cost-share purposes.
5. Catherine Coyle, Planning & Urban Design Manager; City of Tampa, 1400 N. Boulevard, Tampa, FL 33607; 813-274-7702; Catherine.Coyle@tampagov.net. Letter included. Ms. Coyle and her staff will participate in the Project Advisory Committee, disseminate the project results on their website, and use the toolset to implement their Urban Forest Management Plan. She has agreed to volunteer at least 10 hours of her time for cost-share purposes.

6. Jonathan Garber, Ph.D., Associate Director for Ecology, National Health and Environmental Effects Research Laboratory, United States Environmental Protection Agency, Research Triangle Park, NC 27711; 919-541-0480; garber.jonathan@epa.gov. Letter included. As a federal agency, Dr. Garber is precluded from making specific commitments to specific projects. He has stated that it would be appropriate for his EnviroAtlas-Communities Task Lead, Dr. Laura Jackson, to contribute to the project. He specifically mentions Dr. Jackson's ability to assist the project team with assessing the co-benefits of green infrastructure and urban forest ecosystem services.
7. Wayne Zipperer, Ph.D., Research Forester, United States Forest Service, Southern Research Station; P.O.Box 110806, Bldg 164 Mowry Rd, Gainesville, FL 32611, 352-376-4576; wzipperer@fs.fed.us. Letter included. Dr. Zipperer has agreed to offer his time and availability to assist the project team on issues involving ecosystem structure and function related to stormwater management and green infrastructure. He has also agreed to disseminate the project results on his nationally recognized websites, www.urbanforestrysouth.org and www.interfacessouth.org. Wayne has worked closely with members of the project team for several years and his assistance is greatly appreciated.
8. David B. Sivyer, Forestry Services Manager, City of Milwaukee; 841 N Broadway, Room 619, Milwaukee, WI 53202; 414-286-3729; david.sivyer@milwaukee.gov. Letter included. Mr. Sivyer will represent the City of Milwaukee and assist with the case study and testing of the toolset within that City. He will contribute at least 10 hours of his time (a conservative estimate by his estimation) to provide advisory, interdepartmental coordination and results dissemination assistance.

STAKEHOLDER SUPPORT:

1. Holly Greening, Executive Director, Tampa Bay Estuary Program; 263 13th Avenue South, Ste 350, St. Petersburg, FL 33701; 727-893-2765; hgreening@tbep.org. Letter included. Ms. Greening volunteered her organization to participate as a member of the Project Advisory Committee, but did not make any specific time commitment. She emphasized her experience and confidence in the project team. She also described how the proposed products would serve the needs of the Estuary Program as part of their multi-stakeholder role in nutrient management, and described how the organization would assist with dissemination of project results.
2. Several Project Partners have also eloquently described how the project will benefit them, their community, or urban and community forest management more broadly. The reviewer is encouraged to examine the partner letters.
    a. Charlie Marcus emphasized his confidence in the ability of the project team to successfully deliver valuable products. He mentions the applicability of the proposed project results to other metropolitan areas and the benefits for the urban and community forest management community.
    b. David Glicksberg emphasized his confidence in the project team. He also described the specific need for the proposed decision support tools for Hillsborough County.
    c. Catherine Coyle explains why the proposed decision support tools are needed by the planning community, and how the toolset could facilitate the use of urban

forests as a green infrastructure strategy and foster collaboration among stakeholders.

d. Dr, Wayne Zipperer highlighted the fact that the innovative toolset can be used by small and large cites alike. He states that the project should be funded because of the potential contribution to improving livability and sustainability of cities as a result of the secondary social and ecological benefits provided by green infrastructure.
e. David Sivyer represents a mid-western city with some basins that have combined sanitary and stormwater infrastructure. He states the need for decision support tools that can help identify cost-effective alternative stormwater management solutions, while at the same time addressing the challenges faced by urban tree canopy loss due to pests such as Emerald Ash Borer.

PROPOSAL NARRATIVE

1. Project Description

Policy makers and their constituents are becoming increasingly aware of the ecological, economic, and social benefits offered by urban forests. In working with a more scientifically-literate public, urban foresters are now finding themselves charged with the task of managing city trees for specific ecosystem services. A recent focus is the use of trees as part of green infrastructure stormwater best management practices (green BMPs) to manage water quality and to achieve environmental management goals such as nutrient reductions required in total maximum daily loads (TMDLs).

Total nitrogen and phosphate loads in urban runoff are important non-point source pollutants that often lead to eutrophication and associated water quality problems in receiving water bodies. Recent research findings indicate that green infrastructure BMPs that include urban trees and urban forests provide a viable and cost-effective strategy for managing nitrogen and phosphorus pollution in urban runoff. Some of the BMPs involving mature vegetation have been proven to be more effective than conventional 'gray' stormwater BMPs to manage nutrient pollutants in urban runoff. In addition to this stormwater function, green infrastructure strategies that emphasize trees and urban forests provide a range of social and ecological benefits not offered by traditional 'gray' infrastructure systems. Hence there is a call to promote green infrastructure options that include trees and urban forests as stormwater BMPs for water quality control.

Up to now the application of green BMPs and the supporting research are mainly focused on new urban development sites, neglecting the potential for green infrastructure in existing urban areas. It is generally easier to implement innovative green BMP solutions in new developments where there are no limiting inherited conventional 'gray' infrastructures. The downside of this strategy, if restricted in this manner, is that green infrastructure will have limited application in many of the nation's largest communities. Widespread adoption of green drainage infrastructure in North America can only be achieved if the inherited conventional urban stormwater systems in existing urban areas are gradually replaced by green infrastructure. This transition process is complicated as many municipalities feel that they are locked in by the existing conventional infrastructure. Municipal decision makers instinctually opt to replace and repair aging conventional systems rather than develop and implement green BMP retro-fit solutions.

The transition from gray to green infrastructure for urban stormwater management and the promotion of green BMPs that emphasize tree and urban forests can only be achieved with the collaboration of urban foresters, engineers, planners, and environmental managers. Currently this collaboration is constrained by a lack of information exchange and differences in the management and design cultures of the involved disciplines. For example, traditional civil engineers often rely on the well-known costs and longevity of traditional 'gray' infrastructure and tend to avoid the more uncertain and variable performance of green BMPs, even if they hold promise as efficient and cost-effective solutions. A successful transition from gray to green infrastructure requires bridging the gap between the disciplines. Knowledge management and decision support tools are needed to share information and to guide a collaborative planning process to transition from gray to green infrastructure in a clear and accountable manner.

This project proposes the development of a suite of decision-making tools that will help reduce disciplinary barriers and support the transition from gray to green infrastructure. With an emphasis on user-friendliness, the toolset will make existing models and green infrastructure

literature accessible to a wide interdisciplinary audience. Users such as planners and urban forest managerswill interact with the underlying models using a simplified and intuitive user interface. Proposed products include:

- **GIS-tool** to identify the potential to implement green BMPs, including urban trees and forests, in catchments with existing conventional stormwater systems.
- **Optimization tool** to identify an optimal combination of existing gray and new green infrastructure options considering both water quality control as well as other environmental and social benefits of green infrastructure.
- **Decision support tool** to prioritize implementation of green BMPs, and determine the most effective transition pathway from gray to green infrastructure.
- **Intuitive interface** to shield users from the complexity of the underlying models and linkages. This interface will walk users through the modeling process and show them how to assemble and input the required data.
- **Case studies** to test and demonstrate the effectiveness of the transition framework and toolset through its modeled application in urban catchments in the City of Tampa and Hillsborough County (Florida), and City of Milwaukee (Wisconsin).
- **Support documentation** (publications and video sequences) for proposed toolset.

2. Originality and Innovation

The proposed transitioning framework and associated toolset will provide a nationally-relevant model for transitioning from conventional gray to green infrastructure in a planned and cost-effective manner. This framework will also address current knowledge gaps in the transition process. For example, few existing tools address the use of green infrastructure BMPs in existing urban areas (Becker et al. 2005, Peters et al. 2009). Similarly, past efforts typically consider only a small selection of BMPs (such as swale, retention basins, detention basins etc.) and generally lack many BMPs that emphasize urban trees (e.g., rain gardens, riparian buffers, forest remnants). Furthermore, existing resources do not consider whether the characteristics of specific locations (e.g., climate, soil conditions, space constraints) are suitable for the health and longevity of specific tree species utilized in an installation. Addressing these concerns and more, the proposed project will upgrade these tools to identify the potential of green BMPs that emphasize urban trees.

- Most existing tools focus on BMPs for a single site. To facilitate a large-scale transition from gray to green infrastructure and to identify the most cost-effective location options, the project will develop a new tool designed analyze the potential for BMPs within the larger area of a stormwater catchment.
- Current green BMP decision-making tools do not adequately highlight the trade-offs associated with retaining existing gray or developing new green infrastructure. The project's decision support tool will identify optimal balances of cost and performance for various levels of green infrastructure adoption.
- Many existing tools (i.e. SWMM5, SUSTAIN or SUDSloc) are designed mainly for an engineering audience and are largely inaccessible to important municipal stakeholders. All underlying models linked in this project will be adapted for a broad and interdisciplinary user audience that includes urban foresters, planners, and environmental managers. The user interface will be based on an open-source GIS platform and other commonly available applications. The user interface of the tool will be comparable with

user friendly interfaces of the Tampa Bay Water Atlas and TampaTreeMap – projects developed and operated by the consortium partner FCCDR.

- There is a dearth of tools that support the prioritization of retrofit steps in the transition process of urban stormwater systems. Existing approaches for transition sequencing (Kaufmann 2012 and Schiller 2010) are very detailed evaluations of single sites and not applicable to optimize the transition process of a whole stormwater catchment. This work will incorporate innovative approaches for the sequencing the transition pathway from gray to green infrastructure at the catchment scale.
- In many tools the opportunities to implement green infrastructure on private land are neglected. The proposed tool will facilitate the siting of a wide range of green infrastructure options suitable for both public and/or private land. In addition there is often a failure to consider the social acceptance of green infrastructure. The proposed tool provides a means of considering the social, economic, and environmental benefits provided by urban trees and green infrastructure.
- While a several tools exist that look at single steps of the transition process, these resources have yet to be combined into one, holistic approach that optimizes the entire technical transition process. Our project will adapt existing models (i.e SWMM5, EPA Stormwater Calculator or i-Tree-Hydro) developed as general purpose simulation and analysis tools for urban drainage and incorporate them into new applications that address specific stages in the transition process. A detailed comparison of the features of the proposed tool and the features of existing tools is presented in the appendix.

3. Literature Review

Green infrastructure is gaining greater acceptance as a versatile and truly-functional urban stormwater management approach (Davis et. al, 2009). Results from studies performed by Xiao and McPherson (2002), Sanders (1986) and Xiao et al., (2000) showed that urban trees and greenspaces can have a large effect on the hydrology of urban areas, and are an important BMP for flood control and water quality management. More recent research has begun to demonstrate the effectiveness of green BMP strategies that emphasize trees and urban forests to manage and mitigate urban stormwater runoff and associated nutrient pollutants (e.g., Matteo et al. 2006; Collins et al 2010; Denman and May 2006). Although the water management potential of trees is widely known within the urban forest community, barriers to implementation of trees as part of green infrastructure solutions will continue unless the suitability of urban trees and forest as part of green BMPs becomes widely understood and accepted by the stormwater management community. There is a need to integrate the information about the potential contributions of urban trees and forest within decision support tools used by stormwater management professionals.

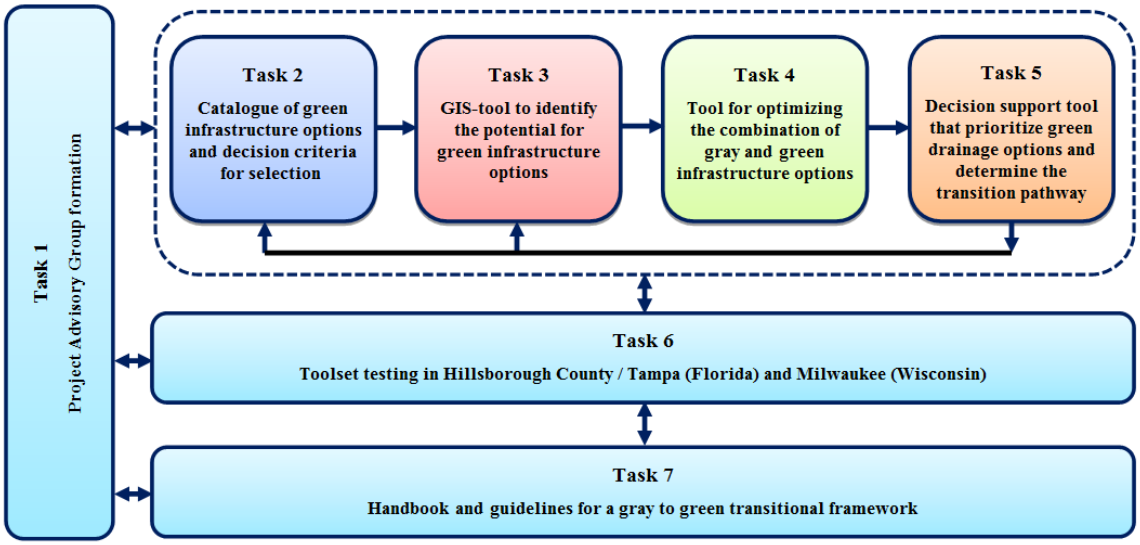
Even cities where green infrastructure is being used for new construction, there has not been a systematic plan to retrofit existing conventional gray stormwater infrastructure (Eckart 2009, Eckart et al. 2012). A major barrier is the difficulty in coordinating the transition of infrastructure components that are managed by stakeholders from different disciplines such as urban forestry, civil engineering, urban planning or environmental management (Kaufmann 2012). Existing decision support tools for identifying the potential of stormwater BMPs exist (e.g., Makropolous et al 2001, Laih et al 2007, Jin et al 2006 and Woods Ballard et al. 2007), but are not suited to bridge the gap between urban forestry and engineering because they are tailored for engineers, have high data requirements, and lack sufficient information about green BMPs related to urban trees and forests. In addition, the tools neglect other important steps of the

transition process, such as the optimization between gray and green infrastructure and the sequencing of the transition process. There is the need to develop a suite of decision support tools better suited to bridge the gap between engineers and urban forest management related professions by including green infrastructure strategies that emphasize trees and urban forests to manage and mitigate urban stormwater runoff. This proposed project will address this problem by developing a suite of decision support tools that will assist these communities to develop plans to transition from gray to green infrastructure.

Note: A lengthier literature review is included in the appendix.

4. Project planning and timeline

This project will develop and demonstrate an innovative transitioning framework from gray to green infrastructure systems for urban watersheds. This will be achieved through the execution of the tasks outlined below and illustrated in figure 1. The duration of the project is expected to be two years (24 months).



Task 1: Project Advisory Committee formation and management (mo. 1)

Objective: Establish a geographically and professionally diverse group of experts to provide guidance, critiques of all project deliverables and assist with national dissemination.

Method: Drawing on the core group of partners and stakeholders outlined in this proposal, the research team will identify key experts who will be vested in the project and its goals for advancing green infrastructure strategies that emphasize trees and urban forests. The first face-to-face meeting of the Advisory Committee will be conducted after the project is awarded. The Advisory Committee will meet via quarterly conference calls over the course of the project. The principal investigators recently held a conference on: *Green Infrastructure and Water Management in Growing Metropolitan Areas*, January 14-16, 2014 at the Patel College of Global Sustainability (http://psgs.usf.edu/patel-center/ 2014-green- infrastructure-conference/). The project will draw on the wealth of insights gained at this successful event – particularly the identification of potential members for the project advisory board. Other major outcomes of the conference presentations and discussions included:

- Confirmation of the need for decision support when transitioning from gray to green infrastructure.

- Confirmation that stakeholders value the additional social, economic, and ecological benefits offered by green infrastructure systems.
- Early success in bringing together urban foresters, engineers, planners, and environmental managers to discuss the potential of large-scale green infrastructure implementation.

Outcomes: Project products that meet the needs of the diverse interdisciplinary communities represented by the Advisory Committee; and a broad dissemination of the results.

Task 2: Catalogue of green infrastructure options and decision criteria for selection (mos. 1-3)

Objective: Develop a catalogue of stormwater BMPs options with an emphasis on urban trees and forests - presenting their cost and performance metrics and providing site selection criteria to the user.

Method: A catalogue of stormwater BMP options will be developed to include qualitative and quantitative criteria necessary to support green infrastructure (i.e., green BMP) selection and prioritization, such as:

- Approximate unit costs,
- Water quality performance metrics (e.g., nitrogen removal potential),
- Qualitative estimates of additional benefits (e.g., heat island reduction potential social benefits)
- Characteristics relevant for the selection of suitable implementation sites (e.g., type of land use, soil type, slope, depth of groundwater).

The catalog will include installations suitable for both public and private land. Specifically, it will include several small-scale green infrastructure options (i.e., green roofs, infiltration swales or rain gardens) which are well suited for private properties. The catalogue will utilize data from existing databases of BMPs such as the International Stormwater Best Management Practice Database (Geosyntec Consultants et al. 2012), the SWITCH project (Viavattene 2009) and the SUSTAIN tool developed for EPA (Laih et al. 2007). Information missing in most databases for green BMPs that emphasize urban forests will be completed based on a review of recent literature and case studies.

Generalized site selection criteria for green BMPs with urban trees and forest will also be added to the catalogue from the literature and available databases (e.g., climate zone, soil conditions, pH, space constraints) to promote the suitability and long-term survival of urban trees. The data required for the identification of suitable locations for BMPs will be standardized in order to facilitate the application of the toolset in different cities of the U.S. For example, land use data will be compatible with the widely used land use and land-cover classification based on Anderson et al. (1976). The identification of the selection criteria will be done in collaboration with the Project Advisory Committee to ensure that all relevant criteria are included.

A decision tree will be developed to guide which (gray and green) BMP options are applicable and suitable for different sites and will help to prioritize applicable BMPs based on their cost and performance. The decision tree will be based on the criteria for the site selection, performance and costs of the stormwater BMPs included in the catalogue.

Outcomes: A catalogue and a decision tree of gray and green stormwater BMPs (including urban trees and forests) for selection and prioritization with estimated performance metrics and costs.

Task 3: Tool to identify the potential for green BMP options in urban watersheds (mos. 2-6)

Objective: To identify the potential to implement green infrastructure BMP options in developed urban areas with existing conventional drainage systems.

Method: GIS-based tools will be developed to identify the water quality management potential for green infrastructure systems based on the catalogue of stormwater BMPs described in Task 2. The tools will be a suite of integrated and partially-integrated GIS processes and procedures necessary to estimate the water quality improvement potential of green infrastructure suitable for different local sub-catchments within a larger urban stormwater system. In order to ensure availability of the toolset to all communities, regardless of financial status, the project team will attempt to develop all tools within an open-source GIS application, such as Quantum GIS (QGIS; www.qgis.org).

The tools will facilitate the collection and management of the different spatial data sets relevant for the identification of suitable BMPs options (identified in Task 2). The tools will also include a process to interface between the GIS database and a performance model for the urban drainage system. The performance model facilitates a baseline assessment of the existing urban drainage system in relation to nitrogen and phosphorus pollution load. This tool will likely draw from the WERF BMP SELECT model (WERF 2013) as it simply and effectively estimates runoff volume, pollutant loads, and system costs. The WERF BMP SELECT model requires minimal input data, reducing barriers to non-experts and helping to bridge the gap between the urban forest, planning and civil engineering community. However, to ensure wider applicability, the toolset will be adaptable and allow in future stages for the use of other BMP performance models, such as: SWMM; SUSTAIN; I-Tree Hydro; HSPF or others. Once the baseline performance assessments are made, a modified version of the GIS-based BMP selection tool developed in the SWITCH project (Viavattene 2009, Peters et al. 2009) will be used to identify suitable BMP options for different local sub-catchments tailored for the specific requirements of the transition process.

As noted in the phone interview sessions, this project will not start from scratch. Rather it will build on existing tools and methods and work to enhance them so they better reflect the unique benefits offered by trees as a critical component of green infrastructure BMPs. The existing BMP selection tool will be improved by considering the specific requirements of BMPs with urban trees and forests (e.g. suitable vegetation for different locations), and utilizing the information from the decision tree developed in Task 2. Those BMPs identified as feasible alternatives in the preceding stage will be prioritized in relation to their cost and performance metrics and the 4-5 most suitable BMP options will be identified for each sub-catchment. In order to visualize the full range of potential water quality improvements that might be obtained within a catchment under various budget scenarios, the toolset will generate marginal cost curves for each sub-catchment. Finally, the toolset will produce a GIS map layer and related dataset of the overall catchment that will include the prioritized and feasible BMP options for each sub-catchment, and the associated cost and performance metrics.

Outcomes: A suite of GIS tools that identifies the potential of green BMPs with particular consideration of urban trees and forests.

Task 4: Tool for optimizing the combination of gray & green infrastructure options (mos. 2-6)

Objective: To identify the optimal combination of existing conventional gray drainage systems and new green BMP options that improves the performance at the lowest cost.

Method: To be supported by the public, the transition from gray to green infrastructure systems must include an optimal combination of existing gray and new green infrastructure systems that achieves the intended performance at the lowest cost. This requires direct comparison among the numerous scenarios available. Each combination of gray and green infrastructure will be analyzed using performance requirements as constraints and the costs as an objective function using Genetic Algorithm (GA). GA is a flexible and powerful tool for solving complex green infrastructure optimization problems (Kaini et al., 2008) and has been used for problems such as the selection and placement of BMP options (Maringanti et al., 2008). The GA optimization will be developed using C++ programming language and coupled with the existing WERF BMP SELECT model (or a comparable model). This GA-SELECT coupled optimization tool will be used to examine the effectiveness of alternative scenarios of combining gray and green infrastructure for controlling stormwater pollution. Scenarios with similar levels of performance will then be compared given their respective whole-life cost. The GA-SELECT model will ensure that local conditions affecting the performance of BMP options (such as local climate, soil etc.) are considered in the optimization process. Using the output map and dataset of BMPs from the GIS toolset described in Task 3, the optimization tool will identify the best combination of elements in the existing conventional gray drainage system to keep and which new green BMPs to implement. An interface will be developed to import the outputs from Task 3 into the SELECT model (or a comparable model) and to guide the users through the optimization process.

The optimization engine will evaluate possible combinations of elements of the existing conventional gray drainage system and different feasible green BMPs. In order to reduce the number of possible combinations, the optimization engine will include a pre-selection process where mutually exclusive BMPs, as well as technical impossible combinations are excluded (e.g., some downstream BMPs cannot be implemented unless specific upstream BMPs are implemented). The optimization tool will also consider constraints such as minimum tree coverage relevant for the social, economic and ecological performance. The GA will evaluate the large number of possible combinations of existing gray and new green BMP options to identify the best combination based on cost, performance, green infrastructure constraints and BMP land area requirements. The optimization will be a nested process that involves two loops: i) find the optimal (lowest cost) scenario (combination and size of options) for an intended level of performance; ii) repeat this loop for different intended levels of performance. The result is a Pareto front of scenarios (combinations and size of options) that are cost optimal for the different performance levels is provided for each of the sub-catchments of the overall catchment.

Outcomes: An optimization tool with graphical interface to optimize the combination of gray and green infrastructure options will be developed.

Task 5: Tool to prioritize green BMP options and determine the transition pathway (mos. 5-10)

Objective: To develop a decision support tool to identify the preferred transition pathway from gray to green infrastructure.

Method: The research team will work with the Project Advisory Committee to develop a user interface that will enable users to select and prioritize their preferred combination of gray and green infrastructure within the sub-catchments. The interface will include a multi-criteria prioritization process similar to Lock et al. (2010) to identify which green BMP options to implement first. Prioritization will be based on user preferences of desired stormwater

management performance, maximum investment costs, and additional prioritization criteria (e.g., ancillary green infrastructure benefits).

Prioritization criteria to be included in the system will be both the list of optimal combination of gray and green infrastructure options for different performance levels (Task 4) as well as additional ecological and social prioritization criteria related to non-stormwater benefits/costs of trees and other green infrastructure. The list of prioritization criteria will be selected by the Project Advisory Committee, and the system will be designed to allow users to choose and weigh the criteria based on their needs. For example the user will be able to assign a weight for the importance of implementing green infrastructure on private versus public lands (taking into consideration factors such as land cost, private land-owner stewardship and ease of project implementation). In order to leverage a rich source of existing ecosystem services and social data that will be nationally applicable, the prioritization system will rely heavily on the new EPA EnviroAtlas (www.epa.gov/ research/enviroatlas/; see partner letter). The EnviroAtlas is a web-based mapping tool that provides access to spatial datasets relevant to ecosystem services. Currently in Beta-testing, the EnviroAtlas will expand to approximately 15 cities, including the test site, Tampa, Florida, by the proposed date of project start and then 50 cities within a couple of years (personal communication; Laura Jackson, U.S. EPA/ORD/NHEERL). For example, green BMPs with urban trees could be prioritized in areas shown by the EnviroAtlas layer "Population near roadway with little to no tree buffer." In addition to linking to the readily available data sources of the EnviroAtlas, the prioritization system will be designed to allow the input of additional data. By prioritizing the implementation of the green BMP options based on social and ecological benefits in addition to stormwater benefits, the toolset can help support multi-disciplinary collaborations and funding partnerships that will enhance urban forest management.

The multi-criteria analysis will be designed to use the utility value method (Fuerst & Scholles 2008); where an aggregated utility value is calculated using different decision criteria, related weighting factors and utility functions (a standardized ranking scale). An analytic hierarchy process (AHP) will be used to identify the weighting of the different decision criteria. The users will compare the importance of all decision criteria pair-wise and the AHP method will calculate the weighting factor of the criteria. In addition, a sensitivity analysis of changing weightings will be provided. The result will be a prioritization showing the relative order in which the sub-catchment with new BMP options should be implemented. This is the transition pathway, the sequence of when to implement the new BMP options in order to achieve the transition goal. Based on the prioritization, the GIS tool will automate the generation of maps for incremented time periods and will develop an animated map showing the order in which the sub-catchments with new BMP options will be implemented; a graphical depiction of the transition pathway from gray to green infrastructure.

Outcomes: The results of the multi-criteria analysis and prioritization process will be a series of maps and detailed project lists that show which BMP options are implemented to transition from gray to green infrastructure.

Task 6 Toolset testing in case study stormwater catchments (mos. 10-14)

Objective: To apply the three tools in two demonstration projects with different climatic conditions to illustrate the national applicability of the toolset.

Method: Every aspect of the toolset will be designed to be nationally applicable. Although, the specific costs and benefits of specific BMP options will be different across the US,

the overall components of the toolset will be widely applicable. Components of the toolset will be designed to allow users to adjust the estimates of cost/benefit, priority rankings related to social and ecological benefits of green infrastructure, and other appropriate local area adjustments. The use of the EnviroAtlas as a major source of information to prioritize green infrastructure will increase the scope of the overall toolset.

The research team has chosen to use Hillsborough County / Tampa (Florida) and Milwaukee (Wisconsin) as case studies to develop the tools. In Hillsborough County / Tampa, the tools will be tested in a humid sub-tropical climate with a stormwater system that is separate from the sewer system. In Milwaukee, the toolset with be tested in a temperate climate using a basin with a combined sewer/stormwater system. The demonstration projects are used to verify that the developed tool can be applied at different locations. In addition the demonstration projects help to verify the reliability of the toolset using appropriate quality assurance and quality control measures such as CMMI. Finally, the demonstration projects serve as examples for the application of the tool to a wider audience and are prominently documented in the user guidelines.

Outcomes: Case study of toolset application in Hillsborough County / Tampa (Florida) and Milwaukee (Wisconsin).

Task 7: Handbook and guidelines for a gray to green transitional framework (month 15-24)

Objective: To produce a transitioning framework that facilitates the transitioning process from gray to green drainage systems across the nation.

Method: The toolset developed in Tasks 3-5 will be included in a systematic framework that provides decision support to implement a transitional process from gray to green drainage systems nationwide. The framework will illustrate how the toolset should be used to identify the potential green BMP options, optimize the combination of gray and green drainage options, and prioritize the order in which the new green BMPs should be implemented (the transition pathway). A handbook will be developed to guide users through the different steps of the transition process. This step-by-step user manual will present the application using the Hillsborough County / Tampa (Florida) and Milwaukee (Wisconsin) demonstration projects. Training modules for the application of the different tools of the transition framework will be provided. Furthermore, recommendations concerning the implementation and practical uses of the proposed transition framework will be included in the reference document. The creation of the handbook will apply the same editorial standards as for educational materials at the International Society of Arboriculture (i.e., all materials will be written at an 8th grade level or lower as assessed through Microsoft Word's readability statistics). The transition framework, the tools and the handbook will be distributed at national level in order to facilitate the technology transfer (for details please refer to chapter 7).

Outcomes: A transitioning framework to guide through the application of the different tools will be developed and complemented by reference documentation and training modules.

5. Products:

The main products of the proposed project include a toolset of the above-described decision support tools for the transition from gray to green drainage systems. These tools will be available on a dedicated public project website that will be hosted at USF. In addition to the toolset, documentation and training modules will also be developed, including:

- Downloadable GIS applications for: (1) identifying the potential for green drainage systems in urban watersheds; (2) determining the optimal mix of new green infrastructure

and existing gray infrastructure given projected costs and benefits; and (3) determining prioritizing green infrastructure projects over given a user-defined timeline.

- Supporting documentation for the decision support toolset will include: (1) step-by-step reference documentation and user manual describing the different steps of the transition framework and the application of the different decision support tools; and (2) Training modules and data derived from the real-world case studies.
- Secondary products associated with the testing and dissemination of the toolset will include: (1) a general press-release/feature article dispersed to urban forestry, civil engineering, planning, public works, and similar associations; (2) a comprehensive workshop at a national professional meeting associated with a target professional audience led by one of the principal investigators; (3) at least one national/regional conference presentation made by the investigators; (4) at least one peer-reviewed journal article documenting the transition framework developed, its application, and its associated case studies; (5) a webinar introducing the tools and demonstrating their functionality to be hosted on the Southern Regional Extension Forestry Webinar Portal, Urban Natural Resources Institute (UNRI), or similar site.

6. Collaboration:

Collaboration with partners and key stakeholders is at the core of this proposal and has already begun in earnest. Last winter, the principal investigators hosted an international conference on *Green Infrastructure and Water Management in Growing Metropolitan Areas* (http://psgs.usf.edu/patel-center/2014-green-infrastructure-conference/). Supported by seed money provided by the USDA Forest Service and support of the Patel College of Global Sustainability, this event featured a strategic discussion session with researchers, industry experts, and government leaders. Feedback and insights gained from this special session will be applied directly to the functionality of the proposed toolset.

This proposed project includes a strong contingent of expert partners and stakeholders who will ultimately serve as the core of the Project Advisory Committee. The early and continuous participation of this Committee (which includes municipal end-users from Tampa, Milwaukee, and elsewhere) will guide and support efforts to make the tools demand driven and user friendly. Most of the Project Advisory Committee members attended the conference. If funded, the research team will continue to meet with them quarterly (via conference call or one-on-one meetings) throughout the project to guide and support the development of all tools and deliverables. This continual contact, combined with the committee's initial interest in the project, will help maintain a vested interest in the work. The research team will rely on the Advisory Committee for both initial feedback and final assessment of all products. The committee will help guide the efforts to make the tools easy to use, functional, and applicable to a wide range of municipalities (given needs and system requirements). All supporting documentation will be vetted through this committee. In addition a workshop at a national conference is included in the distribution/technology transfer plan.

Active engagement with professionals beyond the primary investigators is essential for any project. Given their active involvement, we believe our advisory committee will serve as regional and national multipliers of our efforts to demonstrate the effectiveness of the suite of green infrastructure decision making tools.

7. National Distribution/Technology Transfer

This project is technology transfer in its most direct form: the synthesis and distillation of existing research and models into one functional, user-friendly suite of applications. It serves as a necessary bridge between professionals in numerous disciplines and the researchers that support their efforts by making research accessible to those who can do the most with the findings. All outreach and educational efforts will be team-lead by Co-PIs coming from both engineering and urban forestry backgrounds. This professional diversity greatly reduces the likelihood of critical concepts being inadequately defined or dismissed outright as "common knowledge" among potential users.

To reach the intended audiences, the research team will produce and distribute a general press release article to organizations with a regular newsletter (American Society of Landscape Architects, International Society of Arboriculture, etc.). In the letter accompanying this release, the research team will include an offer to draft a full feature article tailored to their particular membership. The case studies which serve as the first trial of these tools will be submitted as peer review manuscripts in an international scientific journal (Urban Forestry and Urban Greening, Landscape and Urban Planning, Urban Ecosystems, or similar).

As a federally-funded project, the suite of tools and the online reference materials (i.e., user manual, self-paced training modules, webinar) will be available free of charge, in the public domain as open-source material. While the online reference materials are designed to guide full adoption of our tools well beyond the end of the granting period, it is acknowledge that some users may require additional technical assistance or have different training needs. To help train potential users, a comprehensive workshop will be proposed to a national professional meeting (American Planning Association, Partners in Community Forestry, American Public Works Association or similar). This workshop will be a comprehensive tutorial, working through the training modules to provide a baseline understanding of the tools and their application.

Additional presentations will be made at both the national and regional level by the principal investigators to highlight the project and all of its deliverables. Partnering cities will be encouraged to present their experiences implementing the tools at national or regional venues. To reach a wider audience, a webinar will be presented through Urban Forestry South or a similar webinar series. Dr. Wayne Zipperer or the USDA Forest Service Southern Research Station has agreed to disseminate the project results on his nationally recognized websites, www.urbanforestrysouth.org and www.interfacessouth.org. An archived version of this presentation will be included on the main project website with all project deliverables.

In addition the Patel College of Global Sustainability will fund a 0.25 FTE researcher to develop a 'train-the-trainers' program, that will be used to develop a community of trainers that will support greater uptake of the tools developed in this projects and their subsequent application. It is anticipated that the revenue generated from the fee-based course can be used to provide continuous support for backstopping and further developments of the tool. This has proven to be a viable financial model for other projects like the i-Tree suite of urban forestry tools. Many consultancies and private practices conduct contracted i-Tree inventories for communities lacking the capacity to do the work internally. Similarly, non-profits and others with educational missions (e.g., ISA, Florida Urban Forestry Council, Urban Forestry South) offer fee-based i-Tree training to fund their efforts. It is expected that over time there will be numerous individuals and organizations which will provide training and support for the proposed suite of tools and will actively encourage this with the train-the-trainer noted above.

8. Project Evaluation:

A project management team will be formed – comprised of the PI and CO-PIs – to manage the project as outlined in the work plan. The team will be responsible for communicating, coordinating, ensuring quality of work, resolving issues and conflict, adjusting project roles and responsibilities (if needed), controlling project budget, and reporting the progress and final project outcome to the US Forest Service. In addition the project management team will be responsible for evaluating and monitoring the project activities to ensure successful completion of the proposed objectives.

Draft and final tools, reports and results from demonstration projects will be reviewed by the external Project Advisory Committee prior to release. The mathematical models and tools will be verified for accuracy using quantitative verification methods before they are released. They will be reviewed for adherence to relevant standards and specifications. All electronic records generated in this project (e.g., progress reports, final report, tools, data, and analytical results) will be maintained in a secure records management folder and will be retained for a period as prescribed by the US Forest Service. Task leaders will be responsible for the management of data collected and quality control for their assigned tasks. The project management team will ensure that any project results that are posted in web archives, published or otherwise distributed has been thoroughly reviewed before dissemination by internal data review and external peer review (e.g., Advisory Committee).

With regard to outreach and dissemination, the training workshop will feature pre- and post-session evaluations to assess knowledge gained regarding green infrastructure and its implementation. Additionally, participants will be asked to complete a general assessment of the quality of the workshop and the effectiveness of its associated computer lab session. Post presentation surveys, where included as part of a given conference's programming, will be used to guide future dissemination efforts.

Ultimately, the project will be deemed successful if the tools are being used by municipalities to guide their green infrastructure implementation efforts. The management team will track usage of the main project website and the related training modules to assess initial interest, tool downloads, and potential barriers to their use.

9. Experience/Personnel/Adequacy of Resources

The research team represents an interdisciplinary team of experience academic researchers, project managers, urban forest extension and research professionals, and professional consultants from the disciplines of urban forestry, urban planning, geography and environmental science, watershed planning and TMDL management, and civil engineering. The team's capable and proven research staff (comprised of programmers, data analysts, GIS specialists, and more) will be able to develop many of the tools working in parallel. This approach has been highly-successful when working on past projects such as SWITCH and the Water Atlas. The Project Advisory Committee will complement the knowledge and experience of the senior personnel to ensure the success of the project. Sufficient space, computing, and support staff resources are available within the project team's respective organizations. Most importantly, several members of the project team have a successful track record of collaboration. A brief description of the experience of senior personnel, a description of resource adequacy, and an abbreviated biosketch or resume for each personnel is included in the appendix.

Appendix

Budget Justification:

The project partners are proposing to complete this project in 24 months spending $305,334 ($149,722 requested from US Forest Service and $155,612 non-federal cost share).

Personnel including Fringe Benefits:

The PI Dr. Kalanithy Vairavamoorthy will devote 2 weeks in the first year and 2 weeks in the second year to the project. He will oversee, direct and coordinate the project team of the proposed research plan. Dr. Vairavamoorthy's salary of $19,123 (fringe rate 13%) will be provided as cost share from USF.

The CO-PI Dr. Jochen Eckart will devote during the whole project period 5 ¼ months towards the project. He will lead the development of the catalogue of green drainage options, will contribute to the creation of the different GIS tools, will develop the transitional framework and will lead the development of the handbook and guidelines. The total salary of Dr. Eckart will be $37,802 (fringe rate 8%) with 9 weeks $16,201 requested from the US Forest Service and 12 weeks of his salary $21,601 provided as cost share from USF.

The senior research fellow Dr. Seneshaw Tsegaye will devote during the whole project period 9 month towards the project. He will be responsible for the development of the optimization tool for the combination of gray and green infrastructure systems. The total salary of Dr. Tsegaye will be $42,482 (fringe rate 8%) with $20,813 requested from the US Forest Service and $21,669 provided as cost share from USF.

A Graduate Research Assistant will devote during the whole project period 6 month of his 0.5 FTE to support Dr. Eckart and Dr. Tsegaye with the implementation of the project. The total salary of the Graduate Research Assistant will be $14,848 (fringe rate 15%) requested from the US Forest Service. The salary rates for the planned Graduate Research Assistant are based on USF Human Resource Standards.

The CO-PI Dr. Shawn Landry will devote at least one person month (@ 165 hours) towards the project. He will assist in the development and testing of the different GIS transitioning tools and will help to compile the final deliverables. His total budget of $10,000 (fringe rate 56%, including mandated leave pool assessment) will be requested from the US Forest Service

Tom Singleton will devote 192 hours of his time towards the project to support the development of the decision-support prioritization tool and the testing of the complete transition tool-set in the Tampa, Hillsborough County, Florida case study. His salary of $28,800 will be contributed as cost share towards this project.

A Graduate Research Assistant will support Dr Landry and Mr. Singleton in the development of the different GIS transitioning tools. The student will devote 8 person months, distributed over 18 months, towards this project. The total cost for 2-semesters of $17,758 includes $8,000 salary, $2,000 fringe, and $7,758 for tuition waiver will be requested from the US Forest Service. The salary and tuition rates for the planned Graduate Research Assistant are based on USF Human Resource Standards.

Dr. Andrew Koeser will devote during the whole project period 2.5 month of his time towards the project. He will collaborate with the consortium of team members and will oversee GCREC work efforts in the project. Dr. Koeser will assist in the development of the catalogue of green drainage options, will support the application of the finalized tools in the case study in WI,

will assist in the creation of a user manual and tutorials and will contribute to the dissemination and outreach efforts. His total salary of $21,549 (fringe rate 26.3%) will be contributed as cost share from GCREC.

Drew McLean, a Biological Scientist at GCREC will contribute 5 month of his time towards this project and will assist Dr. Jochen Eckart (USF) and Dr. Andrew Koeser (GCREC UFL) in technical writing, tutorial/video vignette development, and dissemination efforts. His total budget of $19,508 (fringe rate 45.5%) will be requested from the US Forest Service.

Robert Northrop will contribute 220 hours of his time towards this project and will lead the dissemination and outreach efforts and will facilitate the Project Advisory Committee. His total salary of $7,000 will be contributed as cost share to this project.

The total personnel cost of the project including fringe for USF is $79,621.86 requested from US Forest Service and $98,193 provided as cost share from USF and the external project partners as well as for UFL $19,508 requested from US Forest Service and $21,550.00 provided as cost share by UFL (see budget narrative table).

Travel:

The travel budget includes 5 trips, of the PI, CO-PIs and the partners responsible for the dissemination, to national conferences in the field of urban forestry or urban drainage to present the transition framework and to deliver the proposed workshop. In addition a total of 3 trips to the demonstration site in Milwaukee (WI) are expected to discuss with the local stakeholders, gather data, to work with partners and assist with case study testing and application design of the transition tool-set. Furthermore 1 trip to present the transition tool-set at different federal agencies in Washington DC as well as 8 trips for Tom Singleton from Tallahassee (FL) for the demonstration project Tampa, Hillsborough County (FL) are included. The estimated costs per trip are presented in the table below. A total travel budget of $13,648 is requested.

Purpose of Travel	**Location**	**Item**	**Computation**	**Cost**
Dissemination on regional and national level conferences = 5 trips	Nation wide	Per diem	3 trips x $208 per night x 3 nights 2 trips x $208 per night x 5 nights	$3,952
		Airfare	5 trips x $650 round trip	$3,250
Visits at Milwaukee (WI) demonstration site = 3 trips	Milwaukee (WI)	Per diem	3 trips x $158 per night x 3 nights	$1,422
		Airfare	3 trips x $350 round trips	$1,050
Visits at Tampa / Hillsb. County (FL) and Milwaukee (WS) demonstration site = 8 trips	Tallahassee - Tampa	Per diem	8 trips x $163 per night x 1 night	$1,304
		Driving	8 trips x 500 miles round trip x 0.445 $/miles	$1,780
Dissemination in Washington DC = 1 trip	Washington DC	Per diem	1 trip x $295 per night x 2 nights	$590
		Airfare	1 trip x $300 round trips	$300
Total Travel				**$13,648**

Equipment: No equipment has to be purchased for the project.

Supplies:

To produce the online reference documentation, to produce dissemination material for presentation at conferences and to produce the webinar introducing the transition toolset a supply budget of total $2,000 is requested (see budget narrative table).

Contractual:

A sub-contract of $27,007 will be provided to UF to including the personnel and fringe benefits as well as travel costs for Dr. Andrew Koeser and Drew McLean.

Construction: No contractual costs occur for the project.

Other: No other costs occur for the project.

Indirect Costs:

An indirect cost rate of 25% is applied to the total direct cost of USF. Based on the total direct costs (excluding cost share) of $118,166 indirect costs of $29.541 will occur. The difference to the federal agreed cost rate of 49.5% of $28,950 will be provided as cost share of USF.

Cost Share Partners

The following external partners have agreed to provide a total of $3,460 as cost share for the project (see budget narrative table):

- Charlie Marcus, Urban Forestry Coordinator, Florida Forest Service; Florida Department of Agriculture and Consumer Services, has agreed to volunteer at least 10 hours for cost-share purposes ($600) to assist the project.
- David Glicksberg, P.G., Manager, Environmental Services Section; Engineering and Environmental Services Division; Hillsborough County Public Works Department, has volunteered at least 15 hours ($1,260) for cost-share purposes.
- Catherine Coyle, Planning & Urban Design Manager; City of Tampa has agreed to volunteer at least 10 hours of her time for cost-share purposes ($600).
- Wayne Zipperer, Ph.D., Research Forester, United States Forest Service, Southern Research Station has agreed to offer his time and availability to assist the project team on issues involving ecosystem structure and function related to stormwater management and green infrastructure.
- David B. Sivyer, Forestry Services Manager, City of Milwaukee will contribute at least 10 hours of his time ($1,000) to provide advisory, interdepartmental coordination and results dissemination assistance.

Budget Narrative Table

	Federal Funds (requested)	**Non-federal match cash / in kind**	**Total**	**Source of matching funds**
Personnel				
Kalanithy Vairavamoorthy		$19,123	$19,123	USF
Jochen Eckart	$16,201	$21,601	$37,802	USF
Seneshaw Tsegaye	$20,813	$21,669	$42,482	USF
Graduate Research Assistant PCGS	$14,848		$14,848	
Shawn Landry	$10,000		$10,000	
Tom Singleton		$28,800	$28,800	Singleton Consulting
Graduate Research Assistant (Landry)	$17,758		$17,758	
Andrew Koeser		$21,549	$21,549	UFL
Drew McLean	$19,508		$19,508	
Robert Northrop		$7,000	$7,000	UFL IFAS
Sub Total	**$99,128**	**$119,742**	**$218.870**	
Travel				
Travel conferences	$7,202		$7,202	
Visits Milwaukee	$2,472		$2,472	
Visits Tampa	$3,084		$3,084	
Visits Washington	$890		$890	
Sub Total	**$13,648**		**$13,648**	
Supplies				
Reference documentation and webinar	$2,000		2,000	
Sub Total	**$2,000**		**2,000**	
Cost Share Partners				
In-kind contribution Florida Forest		$600	$600	Florida Forest Service

Service				
In-kind contribution Hillsborough County		$1,260	$1,260	Hillsborough County
In-kind contribution City of Tampa		$600	$600	City of Tampa
In-kind contribution City of Milwaukee		$1,000	$1,000	City of Milwaukee
Sub Total		**$3,460**	**$3,460**	
Total Costs	**$149,722**	**$155,612**	**$305,334**	

Experience/Personnel/Adequacy of Resources

The project intends to bridge the gap between the urban forest, urban planning, and civil engineering communities. In order to achieve this goal an interdisciplinary team was assembled with experts from urban planning, urban forestry, and civil engineering. Beyond individual experience, our team has a proven track record of **successfully working together** to advance the use of green infrastructure and urban forestry as critical components in stormwater management. The consortium members recently hosted a *Green Infrastructure and Water Management in Growing Metropolitan Areas* conference at the Patel College in Tampa Florida. A brief description of the experience of senior personnel and a description of resource adequacy is provided below. An abbreviated biosketch or resume for each personnel is included toward the end of the appendix in the Senior Personnel Support Documents section.

Kalanithy Vairavamoorthy, is an internationally-recognized expert on water resource management and urban water systems. His main research areas are in the design, operation and management of integrated urban water systems operating under future global change pressures and its implications to water governance issues. He is Professor at the Patel College of Global Sustainability at the University of South Florida. Dr. Vairavamoorthy is also Professor of Sustainable Urban Water Systems at UNESCO-IHE and TUDelft, in the Netherlands. Prior to moving to the United States, he was the Director of SWITCH, a €25M EU research project for Sustainable Water Management for the City of the Future, which is one of the largest EU research projects in the area of water. A major output of the SWITCH project is the "The SWITCH Transition Manual: Managing Water for the City of the Future" which focused on the transition process towards integrated urban water systems in the city of the future. He Co-Chairs IWA's 'Cities of the Future' program and has a strong international profile of working closely with the World Bank, UN-Habitat, UNEP, UNESCO-IHP, IWA and the European Union. Dr. Vairavamoorthy supervised a PhD thesis at the University on Birmingham on the "Transitioning of Urban Water Distribution Systems". He has published more than 80 peer-reviewed papers in academic journals and conference proceedings, published 2 books, edited 3 books, and given more than 50 keynotes in high impact international conferences. Dr. Vairavamoorthy will serve as PI on the project to oversee, direct and coordinate the project team of the proposed research

plan. Dr. Vairavamoorthy will provide technical expertise in the areas of transitioning, urban drainage r systems modeling and water systems optimization.

Jochen Eckart is a senior research fellow (visiting Assistant Professor as of August 2013) at the Patel College of Global Sustainability at the University of South Florida. He is doing interdisciplinary research and policy advice in the field of sustainable and resilient cities with a focus on sustainable urban drainage systems. He did his Ph.D. in Civil and Environmental engineering with the concentration water resources at the University of South Florida and has a Dipl.-Ing. degree (MSc.) in Spatial and Environmental Planning from the University of Kaiserslautern, Germany. His Ph.D. research was on the flexibility of urban drainage systems against future change drivers. From 2006 to 2010 he worked in the EU 6th Framework research project 'SWITCH Managing Water for the City of the Future' in the area of 'Water Sensitive Urban Design' and 'Sustainable Urban Drainage Systems'. As CO-PI he will be responsible to develop the catalogue of green drainage options, will contribute to the creation of the different GIS tools, will develop the transitional framework and will lead the development of the handbook and guidelines.

Shawn Landry is a Research Associate Professor and Program Director of the Florida Center for Community Design and Research at University of South Florida. Landry has a Master's in Botany, a Master's in Management Information Systems, and a Ph.D. in Geography and Environmental Science and Policy (as of August, 2013). Landry has facilitated interdisciplinary applied research as Director of the Florida Center for Community Design and Research since 2003, where he was responsible for budget management, strategic planning, supervising research faculty, technical staff and students, hiring of faculty and other personnel, and management of all facilities. As a PI on over $8 million in total grant and contract funding since 1998, Landry has been responsible for budget allocations, project management, technology transfer and community engagement, spatial and parametric database development, remote sensing and spatial analysis, writing of peer-reviewed articles and project reports, and hiring of staff. He led several applied projects (total funding $1.1m) that provided technical transfer assistance and GPS/GIS mapping of urban water, sewer and stormwater infrastructures. As founder and Co-Principal Investigator for the Water Atlas Program (www.wateratlas.org), he managed a multi-year, multi-sponsor project ($8.7m total funding to-date) to develop and maintain a web-based water resources decision support and informatics software application that provides access to long-term data of the type proposed for use in the existing grant proposal. He also developed and manages the Plant Atlas program (www.plantatlas.org), a nationally appropriate web-based tool for managing plant specimen and distribution information. Landry's expertise in urban forest issues is demonstrated by his involvement as Co-PI on several projects since 1996 that included tree canopy mapping, ecosystem services estimation, management plan development, and environmental equity analysis. Shawn Landry will draw on his experience and expertise in infrastructure and urban forest mapping, technical transfer and applied research, decision support system development, and project management to assist in the development and testing of transitioning tools and compilation of the final deliverables.

Andrew Koeser is an Assistant Professor of Landscape Management at the University of Florida. He an International Society of Arboriculture (ISA) Board Certified Master Arborist, two-time recipient of the Garden Club of America Urban Forestry Fellowship, current member of

ISA Science and Research Committee. Prior to working as an academic, Dr. Koeser served as Science and Research Manager at ISA, producing educational and outreach materials for various audiences including: certification study materials, trade publications, conference programming, and best management practices. Past efforts most pertinent to this project include a series of interactive computer-based training modules and the Arborists' Certification Study Guide. Andrew Koeser will assist in the development of the catalogue of green drainage options, will support the application of the finalized tools in the case study in WI, will assist in the creation of a user manual and tutorials and will contribute to the dissemination and outreach efforts.

Seneshaw Tsegaye is a senior research fellow at the Patel College of Global Sustainability at the University of South Florida. Tsegaye did his M.Sc degree in Integrated Urban Engineering from UNESCO-IHE, Institute for Water Education, The Netherlands and Ph.D. in Civil and Environmental engineering with the concentration water resources at the University of South Florida. Prior to joining the University of South Florida, he worked as a researcher at University of Birmingham, United Kingdom and has been involved with multiple projects related to urban water management. His research areas are integrated urban water management as well as resilient and adaptive infrastructures. His current research focus is Flexible Water Systems that are capable to adapt to the future change pressures and associated uncertainties. He has more than 10 years' experience in developing simulation and optimization models for urban water systems (water supply and urban drainage). He has strong experience in programing languages such as C++, C#, MATLAB, Fortran, Java, Python, Basic. He has developed his own 2D flood modeling tool and coupled with Strom Water management Model (SWMM), Optimization for flexible water systems, agent based model for demand management strategy, clustering tool for integrated urban water systems, and flood damage evaluation tool. He will be responsible to develop of the optimization tool for the combination of gray and green infrastructure systems.

Robert Northrop is the extension forester for the University of Florida IFAS Extension. The focus of his work involves teaching urban and community forestry to natural resource and landscape professionals; and providing conservation planning assistance to local, state and federal governments and community associations. His work in the analysis of societal benefits from urban and semi – natural forests in the Tampa Bay watershed over the last eight years has led to the adoption of a comprehensive urban forest plan by the City of Tampa. Before coming to Florida he worked as the technical watershed forester for the State of Maryland's Chesapeake Bay Restoration Program, served as Director of the Governor's Executive Committee on Trees and Forests in Maryland for forest and wildlife policy, and taught wildlife management at the University of Delaware. Recently, Mr. Northrop managed a two-year project that developed of a framework for sustainable urban forest management and required facilitation of numerous workshops with a diverse number of public and private stakeholders within the City of Tampa, Florida. Robert Northrop will lead the dissemination and outreach efforts of the project and will facilitate the Project Advisory Committee.

Tom Singleton is the president of Thomas L. Singleton Consulting, Inc. He is a biologist by training and a water resource planner by practice with over 35 years of experience in both the public (17 years) and private (18 years) sectors. He is a recognized and nationally published expert in water quality restoration, TMDLs, and watershed planning. As the statewide TMDL coordinator for the Florida Department of Environmental Protection, he developed the policy and

guidance for implementing the nationally recognized TMDL program in Florida. As a private consultant, Tom specializes in helping local governments develop and implement sustainable water resource management plans for urban settings that actively incorporate green infrastructure. He is especially adept at integrating science, planning, and engineering to retrofit the water infrastructure of entire communities. In addition to providing technical, policy, and financial guidance, Tom is strongly committed to helping communities build stakeholder consensus and support for their projects. He brings practical and applied experience to this project. He will support the development of the decision-support prioritization tool and the testing of the complete toolset in the Tampa, Hillsborough County, Florida, and Milwaukee, Wisconsin case studies.

The project will be conducted by the Patel College of Global Sustainability (PCGS) at the University of South Florida. The University of South Florida (USF), established in 1956 as a public university, is a comprehensive multi-campus research university serving more than 47,000 students. The University employs more than 1,585 full-time instructional faculty and more than 4,500 full-time staff. USF has an annual budget of $1.8 billion, and an annual economic impact of $3.2 billion. According to the National Science Foundation, USF is ranked 44th in total research expenditures and 38th in federal research expenditures for public universities. PCGS was established in January of 2012 based on its success as the Patel School of Global Sustainability, which was launched in the fall of 2010. The College fosters cutting-edge research, generates sustainable innovations, and prepares students to address the complex regional, national, and global challenges in sustainability. The College's strength is derived from the involvement of committed faculty, representing many disciplines from natural and social sciences, engineering, business, humanities and arts. PCGS has received international recognition through its involvement in international working groups of water experts in partnerships with UNESCO-IHP, World Bank, UN-Habitat, UNEP and the International Water Association. The Patel College of Global Sustainability provides an up to date computing infrastructure which will support the proposed project. The computing resources at the PSGS include several terabytes of network data storage and 1-2 GIS workstations that can be exclusively dedicated to the project. The existing equipment within college will be used to process and store the data and to prepare reports for the proposed project.

The Florida Center for Community Design and Research (FCCDR) is a statewide research center founded in 1986 to address urban and regional problems related to both the natural and built environment associated with urbanization. The Center employs faculty and graduate students from 11 different academic disciplines and is as an important vehicle for interdisciplinary community engagement at the USF.is housed in the School of Architecture and Community Design at USF. The FCCDR has the hardware and software resources needed for proposed analyses. The geospatial analytical software application ESRI ArcGIS and remote sensing application ENVI are available to Landry through site licensing agreements at USF. Computing resources available at the FCCDR include high-availability online GIS, spatial data-base and web application infrastructure, high-powered 64-bit workstations designed for GIS and remote sensing data processing, and professional GIS, database management and application development staff trained to manage these infrastructures. FCCDR facilities include offices equipped with standard desktop computing, internet, telephone, printing, and other office resources. Facilities to accommodate meetings of the project team, equipped with SMART-board and online collaboration tools are also available for use by the project.

The University of Florida – Gulf Coast Research and Education Center (GCREC) is fully integrated with the nation's largest agricultural university research body. A master's-holding biological technicians from the Koeser lab will assist in the creation of support documentation/videos (using Articulate), and outreach deliverables. These combined efforts will reside on shared lab server space.

Expanded Literature Review

Green infrastructure is gaining greater acceptance as a versatile and truly-functional urban stormwater management approach (Davis et. al, 2009). These systems use a combination of engineered soils and vegetation to both manage the runoff volume by infiltration, evaporation or retention and remove pollutants from runoff through various biological and physical processes (Davis et al., 2009). While some research has been conducted to assess the specific role plants play in these systems, most work has focused on herbaceous materials (Davis et al., 2006; Blecken et al., 2007, Henderson et al., 2007) but also research devoted to woody plants (Bratieres et al. 2008; Denman and May, 2006; Read et al., 2008).

Results from studies performed by Xiao and McPherson (2002), Sanders (1986) and Xiao et al., (2000) showed that urban trees and greenspaces can have a large effect on the hydrology of urban areas, and are an important tool for flood control and water quality management. Insights on the pollution removal potential of stormwater BMPs (including both BMPs with and without urban trees) are presented by Scholes et al. 2008b and the International Stormwater Best Management Practice Database 2012 (Geosyntec Consultants et al. 2012). Current research from Collins et al 2010 illustrates that green BMPs with the presence of mature dense vegetation such as bioretentions, filters and wetlands show greater potential to remove nitrogen from urban runoff than conventional practices such as retention and detention basins. Matteo et al. 2006 illustrated the effectiveness of urban forest BMPs (in particular riparian buffers along water bodies and street buffers) for the reduction of the nitrogen and phosphate pollution in urban runoff. Denman and May, (2006) concluded that street trees and their root zone soils were successful bioretention systems in terms of nitrogen removal. Additionally, Bratieres et al. (2008) and Read et al. (2008) investigated a range of woody species from large shrubs to small trees, to see their pollutant removal efficiencies in these bioretention systems. Recent and ongoing research on fertilization mass balance and woody-plant nitrogen use efficiency may also offer some insights the level of nutrient remediation offered by urban trees (Werner and Jull, 2012; Koeser et al, unpublished). In addition there is research on assessing the ability of specific wood woody species to survive the wide range of environmental conditions (i.e. wet/dry cycles, soil types, etc.) present in green infrastructure systems (Dylewski et al., 2011; Jernigan and Wright, 2011).

Extensively studied, and a focus of this project, are the secondary social and ecological benefits (i.e., ecosystem services) offered by trees and urban forests. These additional ecosystem and human health services serve one of the main advantages of adopting green infrastructure strategies that emphasize trees and urban forests. Past research has documented the myriad of social and ecological benefits provided by urban trees and forests, including: carbon sequestration (Nowak and Crane, 2002) and offsets (Escobedo et al., 2010); moderation of urban temperatures (Oke, 1989); reduction in heating and air conditioning requirements (Akbari, 2002; Donovan and Butry,2009; Simpson, 1998; Simpson and McPherson, 2002); noise abatement (Ozer, 2007); mitigation of air pollution (Escobedo and Nowak, 2009; Escobedo et al., 2008; Nowak, 1994); and particulate filtration (McPherson and Simpson, 1998). Social and health benefits of trees and

urban forests also include: positive effects to residential property values (Anderson and Cordell, 1988; Tyrvainen and Miettinen, 2000); contributions to the desirability of business districts with trees (Wolf, 2005); potential mitigation of the causes of childhood asthma (Lovasi et al., 2008); increased social cohesion (Kweon et al., 1998) and neighborhood vitality (Sullivan et al., 2004), and reduced aggression and crime (Kuo and Sullivan, 2001a,b).

The review on the performance of green infrastructure strategies that emphasize trees and urban forests shows that there is sufficient evidence that they contribute to the cost effective and efficient reduction of nitrogen and phosphate pollution load in urban runoff. The body of research serves as the basis for the I-Tree Hydro application currently being developed by the USDA Forest Service. Although the stormwater management potential of trees is widely known within the urban forest management and research communities, the suitability of urban trees and forest as part of stormwater BMPs is much less widely understood and accepted by civil engineers, urban planners, and environmental managers. Barriers to implementation of trees as part of green infrastructure solutions will continue to exist until their effectiveness as stormwater BMPs can be modeled and understood by the stormwater management community. There is a need to include nutrient removal information in decision support tools for urban stormwater management.

The promising research on BMPs with urban trees and forest as cost efficient and cost effective tools in the management of nitrogen and phosphate loads in urban runoff justifies the intended transition from gray to green infrastructure systems. Several small scale applications of green drainage systems in new land-use areas have been implemented and reported by Butler & Davies 2004, Dietz 2007; EPA 2000, Scholes & Revitt 2008a, nevertheless BMPs are still considered an evolving practice (Dietz 2007). However, the applications of BMPs in new land use areas have not resulted in a relevant change of the existing conventional urban drainage systems (Eckart 2009, Eckart et al. 2012). The conversion and transition of the existing conventional ‘gray’ drainage systems to ‘green’ drainage systems is still lacking.

One of the first examples of a planned transition from existing conventional ‘gray’ urban drainage system to green BMPs in existing urban areas is the Emscherregion in Germany, which committed to disconnect 15 % of the existing drainage system using green BMPs by 2020. (Stemplewski et al. 2006). An U.S. example for the transition of stormwater systems is the “Green Build-out Model” of the District of Columbia Water and Sewer Authority (ASLA 2007). The project demonstrated the efficacy of tree cover and greenroofs as stormwater BMPs in existing urban areas, and that green infrastructure should be an important component of the long-term management of stormwater in the District of Columbia. The majority of available transitioning research in the area of urban water systems and green infrastructure focuses on high level social and institutional aspects related to transition processes (Meinzinger, 2010, Brugge 2009, Jefferies and Duffy 2011). A major barrier is the difficulty in coordinating the transition of infrastructure components that are managed by stakeholders from different disciplines such as urban forestry, civil engineers or environmental managers (Kaufmann 2012). The transition towards green drainage systems will result in extensive investment (the Clean Watersheds Needs Survey 2008 from EPA estimates the cost of replacing existing infrastructure between $700 billion to $1 trillion EPA 2008). Sempewo (2012), Sempewo et al. (2010), Kaufmann (2012), Kaufmann et al. 2007 and Schiller (2010) were among the first to develop a technical strategy to optimize the transition from a conventional drainage system towards BMPs considering cost and performance. Up-to-date research activities have not resulted in any user-friendly tools or frameworks which can support practitioners in the transition process.

One step of the transition process, the identification of the potential of stormwater BMPs, has already been developed as a decision support tool. In the Emscherregion, a 'Stormwater Management Information System (SMIS)' has been developed to support planners in identifying areas that are appropriate to implement stormwater BMPs using site specific characteristics such as geology, topography, soil conditions and geohydrology (Becker et al., 2005 and Sieker et al. 2006, Peters et al. 2009, Becker and Raasch 2005, ARGE 2004). In the EU research project SWITCH, decision support tools were used to support planners in identifying suitable BMPs for different locations (Viavattene 2009). The US EPA supported the development of the toolset SUSTAIN (System for Urban Stormwater Treatment and Analysis Integration Model) (Laih et al. 2007), including a tool to support the selection of suitable locations for common BMPs for pre-determined feasible sites. Other tools to identify the potential of BMPs are presented by Sample et al. 2001, Makropolous et al 2001, Laih et al 2007, Jin et al 2006 and Woods Ballard et al. 2007, Daywater 2005. The existing decision support systems (DSS) for identifying the potential for BMPs are mainly tailored for engineers, have high data requirements, and miss BMPs related to urban trees and forests and hence are not suited to bridge the gap between urban forestry and engineering. In addition, the tools only focus on one step of the transition process neglecting other important steps such as the optimization between gray and green infrastructure or the sequencing of the transition process. Hence there is the need to develop new tools better suited for the purpose of transitioning from gray to green infrastructure.

Expanded Review of Existing Software Tools

There are several existing tools and models which support the design and implementation of green infrastructure services such as SWMM5, SUSTAIN, SUDSLoc, i-Tree Hydro, EPA Stormwater Calculator to name only a view. The audience and core functions of the existing tools are presented in Table 1.

Table 1: Comparison of audience and core function of existing and new tools

Model / Author	Intended Audience	Core Function
Existing Tools		
National Stormwater Calculator (SWC) EPA	• Site developers • Landscape architects • Urban planners	• Simple general purpose model that require limited input data and technical expertise • Estimates the annual amount of rainwater and frequency of runoff from a specific site • Compares different scenarios of the implemented of BMPs
Storm Water Management Model 5.0 (SWMM)	• Stormwater management professionals • Civil and environmental	• General purpose sophisticated urban hydrology and conveyance

EPA	engineers	system hydraulics software • Planning, analysis and design related to: stormwater runoff, sewers, BMPs and other drainage systems • Simulation of runoff quantity and quality
System for Urban Stormwater Treatment and Analysis IntegratioN Model (SUSTAIN) Tetra Tech	• Stormwater management professionals	• BMP Sitting Module – identifying suitable locations for BMPs • Land Simulation Module – models runoff and pollutant loads (based on SWMM 5) • BMP Optimization Module - Identifies cost-effective BMPs for pre-determined sites
i-Tree Hydro (beta) SUNY College of Environmental Science and Forestry and USDA Forest Service (Jun Wang et al.)	• Stormwater management professionals • Foresters	• Vegetation-specific urban hydrology model • Model the effects of changes in urban tree cover on watershed hydrology (hourly stream flows and water quality)
SUDSloc SWITCH (Ingenieurgesell-schaft Sieker, Middlesex University)	• Stormwater management professionals	• GIS based model to identify the potential for BMPs in urban catchments • Decision support tool to identify appropriate positions of BMPs
Proposed Model		
Grey to green infrastructure transition model	• Urban foresters • Civil and environmental engineers • Urban planners • Environmental managers	• Decision support tool for the transition from grey to green infrastructure • Catalogue of stormwater BMP performance and site selection criteria • GIS-based mapping tool to identify potential for BMPs • Optimization tool for mix of gray and green

		infrastructure • Prioritization of transition pathway from grey to green infrastructure.

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Partner and Support Letters

Letters of support from project partners and stakeholders are included on the following pages.

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STATEMENT OF INTENT TO ESTABLISH A CONSORTIUM AGREEMENT

Date: Friday, July 12, 2013

UF Principal Investigator (PI): Andrew Koeser
UF PI Application Title: From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management
Period of Support: October 2014 – September 2016 (2-years)
Support Requested: Federal = $27,007; Non-federal = $25,007

The appropriate programmatic and administrative personnel of each institution involved in this grant application will establish written inter-institutional agreements that will ensure compliance with all pertinent Federal regulations and policies.

The inter-institutional agreements will be consistent with the attached subcontract proposal which consists of a clear description of the work to be performed by the subrecipient institution along with a corresponding budget and budget justification for each budget year and entire budget period, and will take in consideration any budget recommendations by the granting agency.

Grantee Organization	Consortium Institution
University of South Florida	University of Florida
	Andrew Koeser
(signature) (date)	(signature) (date)
Principal Investigator	Principal Investigator
Kalanithy Vairavamoorthy	**Andrew Koeser**
Rebecca Puig 7/15/13	7/12/13
(signature) (date)	(signature) (date)
Official Authorized to sign for Institution	Official Authorized to sign for Institution

THOMAS L. SINGLETON CONSULTING, INC
OWNER'S REPRESENTATIVE • WATER, ENERGY, AND ENVIRONMENTAL SERVICES

July 12, 2013

Ms. Nancy Stremple
Executive Staff to NUCFAC
USDA Forest Service
1611 N. Kent Street, RPE 9
Arlington, VA 22209

RE: 2014 U.S. Forest Service - National Urban and Community Forestry Challenge Cost-Share Grant Program

Dear Ms. Stremple:

This letter documents my commitment and support as a partnering organization to the project entitled "From Gray to Green: Transitioning to Vegetation-Based Stormwater Management," submitted by our lead partner, the University of South Florida. I assisted in developing the proposal and I will assist with all aspects of project oversight. In addition, I will support the development of the decision-support prioritization tool and the testing of the complete toolkit in the Tampa/Hillsborough County, Florida and Milwaukee, Wisconsin case studies.

I will provide 192 hours of my time for a total of $28,800 in cost-share. I do not require any federal funds to support my work in this project.

I have worked with the University of South Florida on past projects and I have tremendous respect for the cutting-edge work they have done in developing GIS-based decision support tools to assist public and private natural resource managers, including me and my firm. I have benefited from their efforts and this is my way of giving back.

By participating in this project and contributing my time pro bono, I hope to share my practical and applied experience to help the University fill a critical gap in stormwater nutrient management and urban habitat preservation. Once developed, I will use the toolkit to assist local governments throughout Florida and the southeast in transitioning from gray to green infrastructure.

Please feel free to contact me if you have any questions.

Sincerely,

Tom Singleton
President

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FAX (813) 744-5776

National Urban and Community Forestry Challenge Cost-Share Grant Program July 10, 2013

This letter serves as documentation of the University of Florida IFAS/ Hillsborough County Extension program's support for the project - ***From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management***. This effort fits well with our sustainability efforts as they relate to protecting water quality and quantity, and meeting our obligation to the development of practical technologies to meet the challenge of state and national nutrient criteria of open water bodies.

Robert Northrop, University of Florida IFAS/Hillsborough Co. Extension Forester will to be actively involved in this project providing leadership in the:

- organization and facilitation of the advisory group;
- development and testing of reference documents, user manual and training modules; and the
- teaching of workshops.
- Matching contribution - The estimated value of the investment from the University of Florida IFAS/Hillsborough County Extension for this project, expressed as a portion of Mr. Northrop's salary, is $7,000 (220 hrs @ $31.88/hr).

We enthusiastically endorse this project and look forward to working with the all of the partners in developing decision-support tools that aid in urban strategic planning for transitioning to green infrastructure systems.

Please do not hesitate to contact me should you need further assistance.

Best Regards,

Stephen Gran
Director
University of Florida IFAS/Hillsborough County Extension
5339 County Road 579
Seffner, FL 33584
Tel. 813-744-5519 x54113

FLORIDA FOREST SERVICE
(850) 488-4274

THE CONNER BUILDING
3125 CONNER BOULEVARD
TALLAHASSEE, FLORIDA 32399-1650

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

COMMISSIONER ADAM H. PUTNAM

July 1, 2013

Ms. Nancy Stremple
USDA Forest Service
1611 North Kent Street RPE 9
Arlington, VA 22209

Dear ~~Ms. Stremple~~ Nancy:

This letter is in support of the NUCFAC grant proposal entitled, "From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management." Faculty and staff from the Universities of Florida and South Florida in the Tampa Bay area are submitting this proposal, which I feel could be equally applicable to other metropolitan areas throughout the United States.

Constrained budgets and the sheer magnitude of required stormwater management structures have prompted engineers and other local officials to explore systems such as green infrastructure that are less expensive and complex to establish and maintain. This project would provide these managers with easily accessible resources to become familiar with the capability of trees to absorb and mitigate the volume of stormwater flow, as well as design stormwater systems that incorporate green infrastructure. Based on my interactions over the past decade with the developers of this proposal, as well as the potential benefits that communities could derive as a result of their proposed project, I highly endorse this application. In fact, I am willing to provide as much as 10 hours of my time to assisting their efforts, which I estimate are worth approximately $600.

The forested areas that would be established and enhanced in the green infrastructure networks can also provide other amenities (known as ecosystem services) to their communities. These include cleaner air, carbon storage, energy savings, wildlife habitat, crime reduction, and increased recreational opportunities. In essence, they would use trees to improve the quality of life for everyone in that community. As a state urban forestry program coordinator, this is my goal for all of Florida's developed areas and this would be one more tool that I could use to help accomplish my goals.

Should you have any questions concerning this grant, please contact me at 850-921-0300 or charles.marcus@freshfromflorida.com at your convenience.

Sincerely,

Charlie

Charles R. Marcus, Urban Forestry Coordinator
Florida Forest Service

Hillsborough County
Florida

Office of the County Administrator
Michael S. Merrill

July 10, 2013

NUCFAC c/o Nancy Stremple

Dear Ms. Stremple,

This letter is in support of the project proposal "From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management" being submitted for consideration under the National Urban and Community Forestry Challenge Cost-Share Grant Program. Hillsborough County Public Works has worked with the project team in the past. In fact, Shawn Landry (PI) initially developed the protocol to inventory and map our stormwater management infrastructure, and created the Hillsborough County Water Atlas project (i.e., www.hillsborough.wateratlas.org). We are confident that they will deliver a high quality product.

We strongly support the need for such a project. Hillsborough County Public Works has considered the use of green infrastructure as part of our stormwater management portfolio, but deciding when and where to implement particular best management practices has been a challenge. This project would develop a suite of planning tools that we could use to maximize the use of treed and other green infrastructure for the benefit of improving water quality at the same time maximizing the additional benefits derived from urban forests. The results of such an effort could also foster collaboration between our stormwater managers and the urban forest management community, for the benefit of all of our citizens.

Hillsborough County Public Works Department looks forward to being an active project partner. Our staff will participate on the Project Advisory Team and assist with testing of the toolset in Hillsborough County. We can also share our stormwater infrastructure, basin delineation, and other relevant datasets with the project team. We will contribute our knowledge of stormwater management, nutrient management and TMDLs, and public works administration to help the project team develop a suite of tools that will have a practical application by the agencies responsible for infrastructure management. We estimate total staff time to provide the assistance described above at 15 hours, at an approximate value of $1,260.

We appreciate the opportunity to support this proposal.

Sincerely,

David Glicksberg

David Glicksberg, P.G., Manager
Environmental Services Section
Engineering and Environmental Services Division
Hillsborough County Public Works Department

CITY OF TAMPA

Bob Buckhorn, Mayor **Planning & Development Department**

July 9, 2013

Attention: NUCFAC c/o Nancy Stremple

RE: 2014 U.S. Forest Service, National Urban and Community Forestry Challenge Cost-Share Grant Program

Project Title: From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management

Dear Ms. Stremple:

The City of Tampa's Planning & Urban Design Division (P&UD), Natural Resources Section, supports and promotes green infrastructure concepts as part of its Urban Forest Management Program and Plan. It is our belief that trees and urban forests provide a wide range of additional social and ecological benefits, and as part of green stormwater management infrastructure solutions, they hold much promise for managing and mitigating stormwater runoff to improve water quality.

We understand that transitioning from grey to green infrastructure is a long-term process. There is a marked need to develop methods and tools that can help our community make the best possible decisions, in selecting the most effective and efficient types of green infrastructure, prioritizing geographic locations to focus our limited budgets, and achieving the maximum benefits for all citizens. As described, we agree that the decision support tools outlined within the "grey to green" project proposed by the University of South Florida and University of Florida (USF/UF) team could be an excellent planning toolset to help our community and others make strategic decisions about green infrastructure investments.

Furthermore, we believe the toolset and decision support system proposed by the USF/UF team could and is likely to benefit stakeholders and other communities as follows:

- Enhance communities' use of urban forests as important strategies for green infrastructure, while also optimizing the social and ecological benefits provided by trees; and,

- Provide a useful toolset to facilitate collaboration among a diversity of stakeholders interested in enhancing the various benefits provided by urban forests, while also mitigating stormwater runoff.

Therefore, we agree to support and contribute to the project through (1) participation on the Project Advisory Team; (2) inclusion of/link to the toolset and associated documents from our P&UD Natural Resources web site (subject to City Web Guidelines); and, (3) use of the toolset in implementing our Urban Forest Management Plan, where appropriate and most beneficial. In reference to (1) above, I will gladly volunteer approximately 10 hours of my time to assist with the Project Advisory Team. For cost-share purposes, the value of my time is $60 per hour. The total estimated value to the project of my volunteer time is therefore $600.00."

Sincerely,

Catherine Coyle
Planning & Urban Design Manager
Catherine.Coyle@tampagov.net
(813) 274-7702

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
National Health and Environmental Effects Research Laboratory
Research Triangle Park, NC 27711

OFFICE OF
RESEARCH AND DEVELOPMENT

July 10, 2013

Nancy Stremple, Special Assistant
USDA Forest Service
Urban and Community Forestry
201 14th Street SW
Washington, D.C. 20250

Re: Letter of Support for USDA Forest Service's National Urban and Community Forestry Challenge Cost-Share Grant Program proposal, **"From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management"**

The Office of the Associate Director for Ecology supports the development of the US EPA's EnviroAtlas, a web-based mapping application for assessing ecosystem services and their benefits to society. This office is responsible in particular for the Communities Component of the EnviroAtlas which is intended to inform local issues including infrastructure planning and spatial efficiencies or inequities in the current distribution of green infrastructure.

As an entity of the Federal government, we are precluded from making commitments of support to any specific grant application. However, it would be appropriate, should the above-referenced research move forward, for the EnviroAtlas-Communities Task Lead, Dr. Laura Jackson, to collaborate with your team. Dr. Jackson is prepared to support this effort by making recent high-resolution land cover classifications available for tool development across several U.S. communities. Clearly, we have mutual interes in the contribution of trees and urban forests to urban storm water management solutions and to the additional urban benefits they provide including temperature modulation, air and water filtration, public recreation, and nature experience. Dr. Jackson would also be available to offer advice to your team on assessing these co-benefits of green infrastructure with your toolset and in combination with other relevant ecosystem services toolsets.

If this proposal is funded, Dr. Jackson looks forward to working with your team to better quantify and communicate the contributions of green infrastructure to community storm water management and other societal issues and challenges. Please contact me if you have any questions or need additional information.

Sincerely,

Jonathan Garber, Ph.D.
Associate Director for Ecology

cc. Laura Jackson, NHEERL

USDA United States Department of Agriculture | Forest Service | Southern Research Station | P.O. Box 110806 Bldg 164 Mowry RD Gainesville, FL 32611

11 July 2013

Nancy Stremple, Special Assistant
USDA Forest Service
Urban and Community Forestry
201 14th Street SW
Washington, D.C. 20250

Dear Ms. Stremple:

I am writing a letter of support for the USDA NUCFAC Cost-Share Grant Program proposal, "**From Gray to Green: Tools for Transitioning Vegetation-Based Stormwater Management**", by Dr. Jochen Eckart and others.

As a city grows, managing stormwater is a major issue for natural resource managers, planners, and urban foresters. The cost of building and maintaining the needed grey infrastructure to treat additional runoff becomes prohibitive. The proposal develops a toolkit for managers to reduce grey infrastructure needed for stormwater management while improving water quality through the use of green infrastructure. This toolkit is innovative, can be used by small and large cities, and provides supplemental services by adding secondary social and ecological benefits.

Because the proposed project dovetails with an objective of our urban program—enhancing the benefits of ecosystem services for urban residents—I will offer 5 percent of my time and availability to the team on issues involving ecosystem structure and function as they relate to stormwater management, if the project is funded. In addition, I will offer the opportunity to post findings and fact sheets on our websites—www.urbanforestrysouth.org and www.interfacesouth.org. These sites are nationally and internationally recognized.

This project should be funded because of its contribution to improving the livability and sustainability of our cities. If funded, I look forward to partnering with the team on this project. If you have any additional questions or need additional information, please feel free to contact me by phone (352-376-4576) or e-mail (wzipperer@fs.fed.us).

Sincerely,

Wayne C. Zipperer, Ph.D.
Research Forester

City of Milwaukee

Department of Public Works
Environmental Services
Forestry Section

Ghassan Korban
Commissioner of Public Works

Preston D. Cole
Director of Operations

David B. Sivyer
Forestry Services Manager

July 12, 2013

NUCFAC c/o Nancy Stremple

RE: 2014 USDA Forest Service, National Urban and Community Forestry Challenge Cost-Share Grant program

Project Title: **From Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management**

Dear Ms. Stremple,

As a nationally recognized leader in the development and implementation of urban forest best management practices, including sustainable green stormwater management solutions, the City of Milwaukee Department of Public Works is pleased to have been selected as a potential case study city for the subject grant project.

Major mid-western cities like Milwaukee that are challenged to manage combined sewer overflows into major waterways are in dire need of simple, yet powerful decision making tools that can help identify and prioritize cost-effective alternative stormwater management solutions. Additionally, communities at risk for significant urban tree canopy loss due to invasive forest pests such as Emerald Ash Borer will be further challenged to mitigate the impending stormwater and water quality impacts accompanying large scale vegetation losses over a short period of time.

Consequently the need for off-the-shelf green infrastructure assessment tools, as well as opportunities for utilization on a nationwide scale, has never been greater. Accordingly, we would urge NUCFAC's support of the proposed project, and we stand ready to provide advisory, interdepartmental coordination and results dissemination assistance as an active partner in this important project. For cost-share purposes a time commitment of 10 hours of my time valued at $100.00 per hour ($1,000) would certainly be a conservative contribution.

Sincerely,

David B. Sivyer
Forestry Services Manager
841 N Broadway, Room 619
Milwaukee, Wisconsin 53202
(414) 286-3729
david.sivyer@milwaukee.gov

NUCFAC c/o Nancy Stremple

Dear Ms. Stremple, July 8, 2013

The Tampa Bay Estuary Program (TBEP) enthusiastically supports the project "Transition from Grey to Green Drainage Systems" for consideration under the National Urban and Community Forestry Challenge Cost-Share Grant Program and looks forward to being an active project partner. This is a strong proposal for a project that will be very beneficial in the pilot areas and will fill a gap in current stormwater nutrient management and urban habitat preservation. TBEP has partnered with many of the team leads in the past and is confident that they will develop excellent and timely environmental and planning tools.

The TBEP is dedicated to protecting and improving Tampa Bay through implementation of a scientifically sound, community-based management plan. Priorities include improving water quality through the reduction of nitrogen pollution, and the protection and restoration of critical estuarine and freshwater habitats. This project dovetails extremely well with several on-going projects seeking to retain natural features such as wetlands, trees and urban forests, and to demonstrate how habitats in an urbanized estuary such as Tampa Bay can provide multiple societal benefits including stormwater quality improvement and wildlife habitat. Through our project "Integrating Nitrogen Management into Planning," TBEP is partnering with the Tampa Bay Regional Planning Council to educate local planners and developers about current nutrient regulations and how the incorporation of green development techniques can help meet these regulatory requirements, while also preserving urban habitats. This project will provide developers, decision makers and community planners with innovative tools necessary for utilizing green drainage options in a meaningful way that will enable a transition from grey to green infrastructure. While a lofty long-term goal, the timing for this project could not be better as communities are required to meet nutrient reduction requirements while also seeking to provide livable and economically- and ecologically-sustainable new and re-development areas.

As a partnership organization, the TBEP looks forward to contributing as a member of the advisory team. TBEP will also disseminate information to its partners through appropriate meetings, via its websites and through targeted outreach to partners. The TBEP has an active Technical Advisory Committee and Nitrogen Management Consortium that may serve as useful sounding boards throughout the process.

We appreciate the opportunity to support this proposal and look forward to being an active team member. If you have questions, please contact me at hgreening@tbep.org or (727) 893-2765.

Cordially,

Holly Greening

Holly Greening
Executive Director

Senior Personnel Support Documents

An abbreviated biosketch or resume for each personnel is included on the following pages.

BIOGRAPHICAL SKETCH

Kalanithy Vairavamoorthy, Ph.D.

Professional Preparation

Institution	Major	Degree and Year
Kings College, University of London	Civil Engineering	B.S. (Hons), 1988
Imperial College, University of London	Environmental Engineering	DIC, 1989
Imperial College, University of London	Environmental Engineering	Masters of Science, 1989
Imperial College, University of London	Environmental and Water Resources Engineering	Ph.D., 1994

Appointments

Jan, 2013 – Present	Dean Patel College of Global Sustainability, Director of the Patel Centre for Global Solutions, Professor, University of South Florida, Tampa, US
2010 – Dec, 2012	Executive Director of Patel School of Global Sustainability, Director of the Patel Centre for Global Solutions, Professor, University of South Florida, Tampa, US
2010 - Present	Professor of Sustainable Urban Water Systems (Zero appt), UNESCO-IHE, Institute for Water Education, Delft, Netherlands
2006 - Present	Professor, (Zero appt), Department of Civil Engineering and Geosciences, Delft University of Technology, Delft, Netherlands.
2006 - April, 2011	Scientific Director of SWITCH European Union Integrated Project for Sustainable Water Management.
2007 - Sept, 2010	Chair Professor of Water Engineering, Department of Civil Engineering, University of Birmingham, UK (80%)
2007 - Sept, 2010	Professor of Sustainable Urban Water Systems, UNESCO-IHE, Institute for Water Education, Delft, Netherlands (20%)
2005- 2007	Chair Professor of Sustainable Urban Water Systems, UNESCO-IHE, Institute for Water Education, Delft, Netherlands (100%)
2002 - 2005	Senior Lecturer (Associate Prof), Loughborough University, UK
2001 - 2002	Senior Researcher, Haestad Methods (HMI), Connecticut, US (2001)
1997 - 2001	Director of Water Development Research Unit, South Bank Uni, London, UK
1993 - 1997	Principal Lecturer in Div. of Civil Eng., South Bank Uni, London, UK

Publications (Over 80 Peer reviewed publications, 6 books, 32 international key notes on urban water and sustainable cities)

Recent Publications (2013)

Books:

2012 Jacobsen, M., Webster, M., **Vairavamoorthy K.** (ed.) The Future of Water in African Cities: Why Waste Water? The World Bank, Washington DC 2012

Journals

2013 Trifunović, N., Maharjan, B., **Vairavamoorthy, K.** Spatial network generation tool for water distribution network design and performance analysis. Water Science & Technology: Water Supply 13:1 (2013) 1-19

2013 Mutikanga, H.E, Sharma, S.K., and **Vairavamoorthy, K**. Review of methods and tools for managing losses in water distribution systems. Journal of Water Resources Planning and Management (ASCE) (doi: 10.1061/(ASCE)WR.1943-5452.0000245)

2012 Tsegaye, S., Eckart, J., **Vairavamoorthy, K.** Urban Water Management in Cities of the Future - Emerging Areas in Developing Countries, On the Water Front - Selections from the 2011 World Water Week in Stockholm pp. 42-48

2012 Eckart, J., Sieker, H., **Vairavamoorthy, K.**, Alsharif, K. Flexible Urban Drainage Systems demand led research for Hamburg-Wilhelsmburg, Rev. Environmental Science and Biotechnology Vol. 11, No. 1., pp. 5-10,

Significant Publications:

2011 Pathirana, A., Tsegaye, S., Gersonius, B. and **Vairavamoorthy, K.** A simple 2-D inundation model for Incorporating flood Damage in Urban Drainage Planning. Hydrology and Earth System Sciences, 15, pp 2747-2761

2011 Delelegn, S., Pathirana, A., Gersonius, B., Adeogun, A. and **Vairavamoorthy, K**. Multiobjective optimisation of cost–benefit of urban flood management using a 1D2D coupled model. Water Science & Technology, 63(5), pp 1053-1059

2010 Eckart, J., Sieker, H., and **Vairavamoorthy, K.** Flexible Urban Drainage Systems. Water Practice & Technology, 5(4), doi:10.2166/wpt.2010.072.

2009 **Vairavamoorthy, K.** Managing Water for the City of the Future. International Review of Landscape Architecture and Urban Design, Vol. 68, pp 94 – 98.

2010 Maharjan, M., Pathirana, A., Gersonius, B. and **Vairavamoorthy, K.** Staged cost optimization of urban storm drainage systems based on hydraulic performance in a changing environment. Hydrology and Earth System Sciences, 13, pp 481–489.

2008 **Vairavamoorthy, K.**, Gorantiwar, S. and Pathirana, A. Managing urban water supplies in developing countries – climate change and water scarcity scenarios. Physics and Chemistry of the Earth, Vol. 33(5): pp 330-339

2008 Pathirana, A., Tsegaye, S., Gersonius, B. and **Vairavamoorthy, K.** A simple 2-D inundation model for Incorporating flood Damage in Urban Drainage Planning. Hydrology and Earth System Sciences Disc., 5, pp 3061-3097.

2007 **Vairavamoorthy, K.,** Gorantiwar, S.D. and Mohan, S. Intermittent water supply under water scarcity situations, Water International, Vol.32(1): pp 121 -132.

Synergistic Activities

- Scientific Director (&PI), EU(FP6): '*SWITCH (Managing water in the city of the future)',* Whole Consortium, $33M (completed in April 2011)
- Member of the *"Technical Committee"* of the Global Water Partnership (GWP)
- Co-Chair -*"Cities of the Future*"- International Water Association (IWA)
- Senior Advisor – *'Sustainable Urban Cities'* UN-HABITAT, World Bank & UNEP

Thesis Advisor and Postgraduate-Scholar Sponsor

- Total 15 PhDs: Graduated: Ali, M., Akinpeleu, E., Yan, J., Li, H., Mansoor, M., Huang, D; Eckart, J. Mutikanage, H., Trifanovic, N. Khatri, K., Tsegye, S., Sempewo, J. Working: Yi, Z., Aden-Buie. G., Weaver E. 50 MSc's - graduated within the last 5 years.

BIOGRAPHICAL SKETCH

Jochen Eckart, Ph.D.

Professional Preparation

Institution	Major	Degree and Year
University of Kaiserslautern, Germany	Spatial and Environmental Planning	Dipl.-Ing.(Master of Science) 2002
University of South Florida, U.S.A.	Civil and Environmental Engineering	Ph.D. 2012

Appointments

8/2012 - Present	Senior Research Fellow (Post-Doc), University of South Florida, Patel College of Global Sustainability, Tampa, USA
8/2010 – 8/2012	Research Fellow, University of South Florida, Patel School of Global Sustainability, Tampa, U.S.A.
7/2006 – 7/2009	Research Fellow, TuTech GmbH / HafenCity Universität Hamburg, Chair of Landscape Design, Hamburg, Germany
2/2003 – 7/2006	Team Leader Traffic Planning, Planungsbüro Richter–Richard, Aachen, Germany
5/2001 – 4/2002	Student Assistant, Ingenieurbüro Kohnen, Freinsheim, Germany
2/1999 – 1/2001	Graduate Research Assistant, Chair of Public Law, Universität Kaiserslautern, Germany

Publications

Recent Publications:

2012 Tsegaye, S., **Eckart, J.,** Vairavamoorthy, K.: Urban Water Management in the Cities of the Future - Emerging Areas in Developing Countries, in: On the Water Front, Volume 3, 2012 pp. 42-48

2012 **Eckart, J.,** Sieker, H., Vairavamoorthy, K., Alsharif, K.: Flexible Urban Drainage Systems Demand Led Research for Hamburg-Wilhelmsburg, in: Rev. Environmental Science and Biotechnology Vol. 11, No. 1., pp. 5-10,

2010 **Eckart, J.,** Sieker, H., and Vairavamoorthy, K.: Flexible Urban Drainage Systems, in: Water Practice & Technology, 5(4), doi:10.2166/wpt.2010.072

2006 Richard, J., **Eckart, J.:** Lärmminderungsplanung und kommunale Verkehrsentwicklungsplanung (Noise abatement planning and local strategic traffic planning), in: Zeitschrift für Lärmbekämpfung 5/2006

2006 Richard, J., **Eckart. J.**: Parkraummanagement in urbanen neuen Wohngebieten (Management of parking pace in new development sites), in: Mobilogisch 2/2006

Significant Publications:

2012 Vairavamoorthy, K., Ghebremichael, K., Jacobsen, M., **Eckart, J.**, Tsegaye, S., Khatri, K.: An Integrated Perspective to Urban Water Management, in: Michael Jacobsen, Michael Webster, Kala Vairavamoorthy (ed.) 2012 The Future of Water in African Cities: Why Waste Water? The World Bank, Washington DC 2012

2011 Chlebek, J., Weber, B., Hoyer, J., **Eckart J.**: A Step Forward in Integrated Urban Water Management – SWITCH in Hamburg, in: John Butterworth, Peter McIntyre and Carmen da Silva (ed.) SWITCH in the City: Putting Urban Water Management to the Test, Delft 2011

2009 Butterworth, J.A., Sutherland, A., Manning, N., Darteh, B., Dziegielewska-Geitz, M., **Eckart, J.,** Batchelor, C., Moriarty, P., Schouten, T., Da Silva, C., Verhagen J., Bury P.J.: Building More Effective Partnerships for Innovation in Urban Water Management, in: Water and Urban Development Paradigms, Feyen Shannon & Neville (ed.) 2009

2009 **Eckart, J.**: Die Zukunft der dezentralen Regenwasserbewirtschaftung? (The future of decentralized urban drainage systems), in: Gulyas H., Otterpohl R. (ed.). Hamburger Berichte zur Siedlungswasserwirtschaft 70 - 21. Kolloquium zur Abwasserwirtschaft Hamburg, 9th – 10th Sep. 2009

2009 **Eckart, J.**: Leben mit mehr Regenwasser – Dezentraler Umgang mit Regenwasser – Techniken und Gestaltung am Fallbeispiel Haulander Weg, (Living with more rainfall – decentralized management of stormwater – technologies and urban design for the case study Haulander Weg) in: Internationale Bauausstellung Hamburg (ed.). IBA Labor Klimafolgenmanagement: Herausforderung Wasser, Dokumentation der Fachtagung 19th – 21st Feb. 2009 Hamburg.

Synergistic Activities(Need to select 5)

- 2012 Flexible Urban Drainage Systems in New Land-Use Areas, PhD dissertation University of South Florida
- 2012 Research report for the World Bank 'The Future of Water in African Cities: Why Waste Water?', Patel School of Global Sustainability, University of South Florida, Tampa, USA
- 2012 Feasibility Study for the World Bank 'Integrated Urban Water Management for Nairobi, Kenya', Patel School of Global Sustainability, University of South Florida, in cooperation with ICLEI
- 2012 Position paper UN-Habitat 'State of Water & Sanitation in the World's Cities 2012 – Looking Ahead to 2050', Patel School of Global Sustainability, University of South Florida, Tampa, USA
- 2011 Draft report for the UNEP International Resource Panel 'Decoupling Economic Growth and Water Consumption', Patel School of Global Sustainability, University of South Florida, Tampa, USA
- 2006- 2010 EU 6th Framework Program SWITCH Sustainable Water Management for the City of the Future, Contribution to: Theme 2 Stormwater Management, Theme 5 Water Sensitive Urban Design and Theme 6 Facilitator Learning Alliance Hamburg

Collaborators & Other Affiliations

Collaborators and Co-Editors

- Prof. Otterpohl, R. (Technical University Hamburg-Harburg, Germany); Prof. Stokman, A. (University of Stuttgart, Germany); Dr. Sieker H. (Ingenierugesselschaft Sieker mbH, Germany); Prof. Dickhaut, W. (HafenCity University Hamburg, Germany)

Graduate Advisors and Postdoctoral Sponsors

- Prof Vairavamoorthy K. (University of South Florida, U.S.A.), Prof. Topp H. (University of Kaiserslautern, Germany)

Seneshaw Tsegaye

BIOGRAPHICAL SKETCH

PROFESSIONAL PREPARATION

- PhD in Civil Engineering (Water Resources) from University of South Florida, Tampa, Fl, USA (2013).
- M.Sc (Integrated urban Engineering), from Municipal water and Infrastructure department, Unesco-IHE Institute for Water Education, Delft, The Netherlands (2008).
- B.Sc. (Civil Engineering), form Addis Ababa University, Technology Faculty, Ethiopia (2004).
- ArcView GIS (Certified), Bahir Dar University in collaboration with Technische Fachhochshule, Berlin (2006).

APPOINTMENTS

May 2013 – Up-to-date	Research fellow in Patel College of Global Sustainability, University of South Florida, United States
Aug 2010 – April 2013	Graduate Research Assistant in Patel College of Global Sustainability, University of South Florida, United States
April 2009 – Aug 2010	Postgraduate Assistant in School of Civil Engineering, University of Birmingham, United Kingdom
June 2009 – Sep 2009	Research Associate, Loughborough University Agent based model for estimation of residential water demand and exploring an optimum demand side water management strategy (EU funded SWITCH Project Work Package 3.1) Loughborough, United Kingdom
April 2008 - April 2009	Lecturer in Water Resource and Environmental Department, Bahir Dar University, Engineering Faculty Ethiopia
Oct 2006 - April 2008	M.Sc. Study at Unesco-IHE Institute for Water Education, Delft, The Netherlands
July 2005 - Oct 2006	Assistant Lecturer in Civil Engineering Department, Bahir Dar University, Engineering Faculty Ethiopia.
July 200 - July 2005	Graduate Assistant II in Civil Engineering Department, Bahir Dar University, Engineering Faculty Ethiopia.

PUBLICATIONS

Vairavamoorthy, K., Ghebremichael, K., Jacobsen, M., Eckart, J., **Tsegaye, S.,** and Khatri, K. (2012) Chapter 2: An Integrated Perspective for Urban Water Management: Michael Webster, Kala Vairavamoorthy (ed.), The Future of Water in African Cities: Why Waste Water? .The World Bank.

Tsegaye, S., Eckart, J., Vairavamoorthy, K. (2012): *Urban Water Management in the Cities of the Future - Emerging Areas in Developing Countries*: On the Water Front, Volume 3, 2012 pp. 42-48

Tsegaye, S., and Vairavamoorthy, K. (2011*) Water Distribution Systems: Design of Water Distribution Systems (Chapter 7),* ICE Publishing,Thomas Telford, UK.

Tsegaye, S., and Vairavamoorthy, K. (2011) *Water Demand management in the City of the Future: Agent Based Modelling for Demand Side Water Management Strategies (Chapter 5),* Water, Engineering and Development Center, Loughborough University, UK.

Pathirana, A., **Tsegaye, S**., Gersonius, B., and Vairavamoorthy, K. (2008) A Simple 2-D Inundation Model for Incorporating Flood Damage in Urban Drainage Planning *Journal of Hydrology and Earth System Sciences*, **5**, 3061–3097.

Tsegaye, S., Eckart, J., and Vairavamoorthy, K. (2011) Decision Support Framework for Design of Flexible Urban Water Distribution Systems. *The Future of Urban Water: Solutions for Livable and Resilient Cities,*Paris

Huang, D., Vairavamoorthy, K., and **Tsegaye, S.** (2010) Flexible Design of Urban Water Distribution Networks *World Environmental & Water Resources Congress 2010*, Rhode Island, USA.

Tsegaye, S., and Vairavamoorthy, K. (2012) Water for Cities of the Future - Coping with Future Change and Uncertainties. *American Water Resources Association* St. Petersburg, FL.

SYNERGISTIC ACTIVITIES

- Development of modeling tool for decentralization of urban wat6er systems in emerging areas, Patel College of Global Sustainability, University of South Florida, Tampa, USA (2013)
- Flexible Urban Water Distribution Systems, PhD dissertation University of South Florida, Tampa, USA (2013)
- 2012 Research report for the World Bank 'The Future of Water in African Cities: Why Waste Water?', Patel College of Global Sustainability, University of South Florida, Tampa, USA (2012)
- 2012 Feasibility Study for the World Bank 'Integrated Urban Water Management for Nairobi, Kenya', Patel School of Global Sustainability, University of South Florida, in cooperation with ICLEI (2012)
- Position paper UN-Habitat 'State of Water & Sanitation in the World's Cities 2012 – Looking Ahead to 2050', Patel School of Global Sustainability, University of South Florida, Tampa, USA (2012)
- Draft report for the UNEP International Resource Panel 'Decoupling Economic Growth and Water Consumption', Patel School of Global Sustainability, University of South Florida, Tampa, USA (2011)
- Development of 2-D Inundation Model for Incorporating Flood Damage in Urban Drainage Planning, Unesco-IHE Institute for Water Education, Delft, The Netherlands (2008).

Shawn M. Landry
Biosketch

a. Professional Preparation

University of New Hampshire	Plant Biology	B.S. 1992
University of South Florida	Botany	M.S. 1996
University of South Florida	Management Information Systems	M.S. 2005
University of South Florida	Geography and Environmental Science and Policy	Ph.D. 2013

b. Appointments

Research Associate Professor, U. South Florida, 2011-
Program Director, Florida Center for Community Design and Research, U. South Florida, 2003-
Associate in Research Faculty, Florida Center for CD+R, U. South Florida, 1998-2011
Research Associate, Florida Center for CD+R, U. South Florida, 1995-1998
Research Associate, Institute for Systematic Botany, University of South Florida, 1994-1997
Consulting Botanist, Florida Natural Areas Inventory, 1994-1997
University Recycling Coordinator, University of New Hampshire, 1991-1994

c. Publications

(i) Five Most Closely Related to the Proposed Project

Rains, M., S. Landry, K. Rains, V. Seidel, Tom Crisman (accepted). “Using net wetland loss, current wetland condition, and planned future watershed condition for wetland conservation planning and prioritization, Tampa Bay Watershed, Florida.” Wetlands.

Pu, R. and Landry, S.M. (2012). “A comparative analysis of high spatial resolution IKONOS and WorldView-2 imagery for mapping urban tree species.” Remote Sensing of Environment 124: 516-533

Landry, S. M. and R. Pu (2010). "The impact of land development regulation on residential tree cover: An empirical evaluation using high-resolution IKONOS imagery." Landscape and Urban Planning 94(2): 94-104.

Landry, S. M. and J. Chakraborty (2009). "Street trees and equity: evaluating the spatial distribution of an urban amenity." Environment and Planning A 41(11): 2651-2670.

Andreu, M.G., M.H. Friedman, S.M. Landry and R.J. Northrop. 2008. City of Tampa Urban Ecological Analysis 2006-2007. Final Report to the City of Tampa, April 24, 2008. City of Tampa, Florida.

(ii) Five Other Significant Publications

Pham, Thi-Thanh-Hien, Philippe Apparicio, Shawn Landry, Anne-Marie Seguin, Martin Gagnon (2013). “Predictors of the distribution of street and backyard vegetation in Montreal, Canada.” Urban Forestry & Urban Greening 12(1): 18-27.

Pham, T.-T.-H., P. Apparicio, Anne-Marie Séguin, S.M. Landry, M. Gagnon (2012). "Spatial distribution of vegetation in Montreal: An uneven distribution or environmental inequity?" Landscape and Urban Planning 107(3): 214-224.

Pu, R, S. Landry and Q. Yu. 2011. “Object-based urban detailed land cover classification with high spatial resolution IKONOS imagery.” International Journal of Remote Sensing, 32(12), 3285-3308.

Landry, SM, Andreu, MG, Friedman, MH, & Northrop, RJ. 2009. A report on the City of Tampa’s existing and possible urban tree canopy. Final report to the City of Tampa, February 19, 2009. City of Tampa, Florida.

Landry, S.M. 2008. The Effect of Urban Redevelopment on Vegetation Cover: An Exploratory Analysis in Tampa, FL. Proceedings from the Association of American Geographers 2008 Annual Meeting. April 15-19, 2008. Boston, Massachusetts.

d. Relevant Synergistic Activities

(1) Facilitated interdisciplinary research as Director of the Florida Center for Community Design and Research since 2003. Located at the University of South Florida, the Florida Center is a statewide research center founded in 1986 to address urban and regional problems related to both the natural and built environment associated with urbanization. The Center employs faculty and graduate students from 11 different academic disciplines and is as an important vehicle for interdisciplinary community engagement at the University of South Florida.

(2) Principal Investigator on Florida Forest Service funded, 2012-2013, Tools and Training to Support Volunteer-Based Tree Inventories in Florida Communities ($38,808). Implementing OpenTreeMap (www.TampaTreeMap.org) as part of the project.

(3) Principal Investigator with Jason Scolaro (Co-PI) and Keith Bornhorst (Co-PI) on web-based field inventory, inspection and management application, "Hillsborough County Parks, Recreation, ELAPP and Burns Web Application." 2012-ongoing. Hillsborough County ($50,755, $5,000 annual support).

(4) Member, The Tampa Bay Watershed Forest Working Group (2007-). Research collaborator on multiple projects investigating ecosystem services, land cover change and urban forest management with Michael G. Andreu, Asst. Professor-Forest Systems, University of Florida and Robert Northrop, Extension Forester, Hillsborough County – Cooperative Extension Service.

(5) Principal Investigator or Co-PI on several Urban Forest related research efforts, including: Principal Investigator (with Co-PI M. Andreu and R. Northrop), City of Tampa Urban Ecological Analysis and Management Plan 2010-2012. City of Tampa ($250,000); Principal Investigator, City of Tampa Urban Forest Website 2012-2013. City of Tampa ($20,000); Co-Principal Investigator (with Michael Andreu PI), 2010-2012, Characterization and modeling of Nitrogen loading from transportation sources and attenuation by roadside vegetation buffers in an urbanized watershed. EPA. ($16,170 on total grant of $155,000).

(6) Founder and Co-Principal Investigator, Water Atlas Program (www.wateratlas.org). The Water Atlas is web-based water resources informatics software application supported by an ongoing partnership with many local and regional sponsors. Annual program funding approximately $580,000; total funding since program inception over $5.5 million. Program started in 1998 and is ongoing.

e. Collaborators & Other Affiliations

(i) Collaborators and Co-Editors

Michael Andreu, University of Florida
Kathy Beck, City of Tampa (FL)
Jayajit Chakraborty, University of South Florida
Ron Chandler, University of South Florida
Thomas Crisman, University of South Florida
Holly Greening, Tampa Bay Estuary Program
James Griffin, University of South Florida
J. Morgan Grove, USDA Forest Service
B. Terry Johnson, University of South Florida
Brian Keener, University of West Alabama
David Lewis, University of South Florida
Robert Northrop, Hillsborough County Extension (FL)
Jarlath O'Neil-Dunne, University of Vermont
Ruiliang Pu, University of South Florida
Mark Rains, University of South Florida
Valerie Seidel, Balmoral Group
Troy Weldy, Eastern New York Chapter, Nature Conservancy
Richard Wunderlin, University of South Florida

(ii) Graduate Advisors

Jayajit Chakraborty, Department of Geography, University of South Florida
Donald Berndt, Information Systems & Decision Sciences Department, University of South Florida
Richard Wunderlin, Department of Biology, University of South Florida
Margaret Lowman, Marie Selby Botanical Garden

(iii) Thesis Advisor

Lana Radl, Master of Global Sustainability, University of South Florida
Jennifer Vessels, Master of Global Sustainability, University of South Florida
Diego Duran, Master of Architecture, University of South Florida
Mario Rodriguez, Master of Architecture, University of South Florida

CURRICULUM VITAE

ANDREW K. KOESER

Address: University of Florida-GCREC, 14625 CR 672, Wimauma, FL 33598
Phone: 813-633-4150
E-mail: akoeser@ufl.edu

(a) EDUCATION

University of Illinois at Urbana-Champaign, Crop Science (Horticulture and Biometry), PhD, 2013

University of Illinois at Urbana-Champaign, Natural Resources and Environmental Science (Horticulture), MS, 2008

University of Wisconsin -Stevens Point, Forestry (Urban Forestry), BS, 2005

(b) PROFESSIONAL EXPERIENCE

2013-Present	Assistant Professor – University of Florida - GCREC, Wimauma, Florida
2009-Present	ISA Board Certified Master Arborist
2008-2010	Science and Research Manager – International Society of Arboriculture, Champaign, Illinois
2006-2008	EG&S Intern– International Society of Arboriculture, Champaign, Illinois

(c) (i) PUBLICATIONS

Koeser, A.K., R. Hauer, K. Norris, and R. Krouse. (Online Pre-press). Factors Influencing Long-term Street Tree Survival in Milwaukee, WI, USA. *Urban Forestry and Urban Greening* 12(4):XXX-XXX.

Koeser, A.K., S. T. Lovell, M.R. Evans, and J.R. Stewart. 2013. Biocontainer Water Use in Short-Term Greenhouse Crop Production. *HortTechnology* 23(2):215-219.

Koeser, A.K., G. Kling, C. Miller, and D. Warnock 2013. Compatibility of Biocontainers in Commercial Greenhouse Crop Production. *HortTechnology* 23(2):149-156.

Koeser, A.K., J.R. Stewart, G.A. Bollero, D.G. Bullock, and D. K.Struve. 2009. Impacts of Handling and Transport on the Growth and Survival of Balled-and-burlapped Trees. *HortScience* 44(1):53-58.

Stewart, J.R., R.D. Landes, A.K. Koeser, and A.L. Pettay. 2007. Net photosynthesis and growth of three novel woody species under water stress: *Calycanthus occidentalis, Fraxinus anomala*, and *Pinckneya pubens*. *HortScience* 42:1341-1345.

(c) (ii) OTHER PUBLICATIONS

Watson, G. and A. K. Koeser. 2009. The Landscape Below Ground III Researcher Summit White Paper. in *The Landscape Below Ground III: Proceedings of an International Workshop on Tree Root Development in Urban Soils.* Ed. By G.Watson, L. Costello, B.

Scharenbroch, and E. Gilman. International Society of Arboriculture. (available online at *http://www.isa arbor.com/publications/ resources/litReview/Root_Growth_and_Dev_Whitepaper.pdf*)
Koeser, A. K. 2009. Trees & Risk Researcher Summit White Paper. in Trees & Risk. Ed.By A. K. Koeser and E. T. Smiley. International Society of Arboriculture.(available online at *http://www.isa-arbor.com/publications/resources/litReview/ Trees_and_Risk_White_Paper_EGM.pd*f)
Koeser, A. K. 2009. Trees and Water: Staying Wet on Dry Land. *Arborist News* 18(4):54-58.

(d) Synergistic Activities

Contributor, Tampa Bay Watershed Forest Working Group
This collaborative brings together participants from federal, state, regional, and municipal governments as well as professionals in the private sector (NGO & for profit). This collaborative fosters sharing of information and resources to enhance the sustainable management of the urban and urbanizing forests within the Tampa Bay watershed which covers a five county area in Central Florida. (2013-ongoing)

ISA Staff Lead, Biomechanics Week of Research
Served as the main ISA lead for an experimental Biomechanics Week of Research – supporting the efforts of 13 international research teams with travel funding, accommodations, trees, sponsored volunteer arborist technicians, safety personnel, and equipment.

Member at Large – ISA Science and Research Committee
Nominated to committee as full Member at Large after transitioning from Staff Liaison. Work to advance ISA research initiatives including their contracted/granted literature review series, technology transfer efforts, and scientific awards nominations.

(e) Past/Current Collaborators
Shawn Landry, University of South Florida; Richard Hauer, University of Wisconsin-Stevens Point; Jeff Edgar, Silver Creek Nursery; Dewayn Ingram, University of Kentucky; Robert Irving, City of Tampa

CURRICULUM VITAE

ROBERT J. NORTHROP

Address: University of Florida IFAS Extension, 5339 CR 579, Seffner, FL 33584
Phone: 813-744-5519
E-mail: **northrop@ufl.edu**

(a) EDUCATION

2004-2009	University of Delaware, College of Agriculture and Natural Resources, Newark, DE. Master of Science in Wildlife Ecology
1976-1980	Virginia Polytechnic Institute and State University, Blacksburg, VA. Bachelor of Science in Forestry and Wildlife.

(b) PROFESSIONAL EXPERIENCE

2005-Present	Extension Forester – University of Florida IFAS Extension, Seffner, Florida
1985-2005	Watershed Forester – Maryland Department of Natural Resources, Annapolis, Maryland
1984-1985	Soil Conservationist – USDA Soil Conservation Service, Dinwiddie, VA

(c) (i) PUBLICATIONS

Northrop, R.J. 2009. Development and Assessment of a Habitat Relatioshioship Model for Terrestrial Vertebrates in the State of Maryland. 151 pp.

Andreu, M. G., M. H. Friedman, S. M. Landry, R. J. Northrop, 2008. City of Tampa Urban Ecological Analysis 2006 – 2007. Final Report to the City of Tampa, April 24, 2008. City of Tampa, Florida. University of Florida Cooperative Extension Service FOR 203.

Northrop, R.J. Francisco Escobedo, and Jennifer A. Seitz. 2007. An urban forestry needs assessment for rapidly urbanizing Florida: Assessing Community Perceptions and Attitudes Toward Urban and Urbanizing Forests. In: Proceedings Emerging Issues Along Urban/Rural Interfaces – Linking Land Use Science and Society.

Twery, M.J. and R.J. Northrop. 2003. Watershed management using decision support technology. In: Proceedings of the Society of American Foresters 2003 National Convention.

Northrop, R.J. 2003. Source water protection through forest management: a contemporary ecological perspective. In: Proceedings of the American Water Resources Association 2003 international congress on watershed management for water supply systems.

Grove, J.M, Hinson, K., and R. Northrop 2003. "Social ecology approach to understanding urban ecosystems and landscapes." In A.R. Berkowitz, C.H. Nilon and K.S. Hollweg, editors. Understanding urban ecosystems: a new frontier for science and education. Springer-Verlag, NY.

(c) (ii) OTHER PUBLICATIONS

Andreu, M. G., M. Friedman, R. Northrop. 2009. The Structure and Composition of Tampa's Urban Forest. University of Florida Cooperative Extension Service FOR 209.

Andreu, M. G., M. Friedman, R. Northrop. 2009. Environmental Services Provided by Tampa's Urban Forest. University of Florida Cooperative Extension Service FOR 204.
Escobedo, F., R.J. Northrop, W. Zipperer. 2007. Developing an Urban Forest Management Plan for Hurricane-Prone Communities. University of Florida – FOR 121. 11pp.
Northrop, R.J. 2000. City of Baltimore municipal reservoirs, incorporating forest management principles and practices. In: George E. Dissmeyer, editor. Drinking water from forests and grasslands, a synthesis of the scientific literature. USDA Forest Service. Gen. Tech. Rep. SRS-39.
Northrop, R.J. 1996. Urban forest ecosystem management. In: Proceedings of the Society of American Foresters 1996 National Convention.
Thompson, E.R. and R.J. Northrop. 1991. Natural design in development, building cooperation and communication between private and public sectors. J. of Maryland Planning.

(d) Synergistic Activities

Co-coordinator, Tampa Bay Watershed Forest Working Group
This collaborative brings together participants from federal, state, regional, and municipal governments as well as professionals in the private sector (NGO & for profit). This collaborative fosters sharing of information and resources to enhance the sustainable management of the urban and urbanizing forests within the Tampa Bay watershed which covers a five county area in Central Florida. (2006-ongoing)

Director, Governor's Executive Committee on Trees and Forests in Maryland
Led an appointed group of political, natural resource agency and industry leaders in the development of policy and programmatic initiatives concerning forest and wildlife conservation for the Governor of Maryland. (1987 – 1996)

Executive Director, Alliance for the Maryland Forest
Led not-for-profit group whose principle activity was the organization and presentation of natural resource management education programs. (1987 – 1994)

(e) Collaborators

Shawn Landry, Univ. of S. FL, Michael Andreu, University of Florida; Francisco Escobedo, University of Florida; Taylor Stein, University of Florida; Wayne Zipperer, U.S. Forest Service

Thomas L. Singleton
Biosketch

a. Professional Preparation
B.S., Biology, Florida State University, 1977
Graduate Fellow, Florida Natural Resources Leadership Institute, Florida State University/University of Florida, Charter Class, 1999

b. Appointments
Thomas L. Singleton Consulting, Inc, President, 2012 to present
Atkins Global, Senior Vice President, 2008-2012
Florida Department of Environmental Protection, Administrator, 1996-2008
South Florida Water Management District, Governmental Representative, 1991-1996

c. Publications
(i) Five Most Closely Related to the Proposed Project
Singleton and Latham, November 2012. "Winter Haven Chain of Lakes: Conservation and Restoration Targets for Sustainable and Innovative Watershed Planning, Winter Haven, Florida" Atkins Technical Journal #9.
Singleton, April 2011. "Sustainable Water Resource Management Plan: A plan for restoring and protecting the water resources of the Peace Creek Watershed and Winter Haven, Florida, USA." Atkins Technical Journal #6, paper 92.
Singleton, Brown, Pfahler, Wapnick, and Britt, November/December 2009: 20-33. "Sustainable Water Resource Management: A Conceptual Plan for the Peace Creek Watershed and the City of Winter Haven, Florida." Stormwater Magazine.
Singleton, et al, 2000-2006. "Water Quality Status and Assessment Reports, a series of 10 reports for the major river basins in SW Florida." Florida Department of Environmental Protection (FDEP).
Singleton and Lord, 1999. "A Framework for Implementing the Watershed Approach to Developing and Implementing TMDLs in Florida" FDEP.

(ii) Five Other Significant Publications
Bourne, Brumbelow, Gowdish, Singleton, November 2011. "A Web-based Tool for Estimating Climate Change Induced Shifts in Storm Intensity and Frequency in Florida." Societies, Estuaries, and Coasts: Adapting to Change, Coastal and Estuarine Research Federation.
Seidel, Blankenship, Singleton, et al, June 2011. "A Case Study of Stakeholder Participation in Source Water Protection." American Water Resource Association.
Hampson, Bourne, and Singleton, January 2010: 13-15. "Return on Investment from New GIS Technologies for Water Resources Engineering, Science, and Planning." Water Resources Impact, American Water Resource Association.
Wapnick, Singleton, and Harwood, May 2009: 12-30. "Beating Bacteria, A New Methodology for Identifying and Prioritizing Water Bodies with High Concentrations of Fecal Coliform." Stormwater Magazine.
Singleton, Bourne, and Hampson, 2009. "A Pragmatic Cycle for Ongoing Water Resources Research and Management." ASCE World Environmental and Water Resources Congress.

d. Relevant Synergistic Activities
1) Peace Creek Watershed Sustainable Water Resources Management Plan Development Services, Winter Haven, Florida (City of Winter Haven). Project director and principal

author. Project involved development of a sustainable water resource management plan with significant stakeholder participation. The backbone of the plan is an interconnected network of lakes, canals, wetlands, aquifers, open spaces, and parks, designed to meet the long-term water resource needs of the community, including supply (water quantity), treatment (water quality), flood protection, and the preservation of natural resources. The plan received the 2011 APEX Grand Award for excellence in writing and an award of excellence for layout and design and was featured in the November/December 2009 issue of *Stormwater* magazine, the November 2009 Florida Engineering Society Journal, and the April 2011 Atkins Technical Journal. 2011.

2) Development of Conservation and Restoration Targets for Sustainable Water Resource Management, Winter Haven, Florida (City of Winter Haven). Project director. Project evaluated the water resource functions for all landscape features within the watershed, including ecological processes and their relationships with identified water resource benefits (water storage, water quality treatment, environmental resources, flood protection, cultural and recreational amenities, and other benefits). The targets will guide local and regional, land and water resource decision-making in implementing the City's sustainability plan. The project was the silver medal winner of the 2011 Atkins National Recognition Award and was featured in the November 2012 Atkins Technical Journal. 2012.
3) Development of Sustainable Water Management Plan and Environmental Flows for the Apalachicola-Chattahoochee-Flint (ACF) Rivers Basin, Florida, Georgia, and Alabama (ACF Stakeholders). Project director. Project involved the development of environmental flow recommendations for the Apalachicola, Flint, and Chattahoochee rivers. The project, which will maximize the beneficial use of water for the environment and people, included an extensive literature and case study review. Significant stakeholder coordination, communication, and education were required to secure consensus on and approval of all project deliverables. 2012.
4) Collier County Watershed Management Plan, Collier County, Florida (Collier County). Project Director responsible for technical approach and selection of non-structural solutions for addressing water quality, water quantity, and natural system issues. Project involved the development of an integrated watershed management plan to balance the water needs of both the human and natural system environments in the County’s watersheds and estuaries. The plan takes advantage of opportunities for restoring the natural ability of the landscape to benefit the human environment and protect the water quality, water quantity, and natural systems in the County. This approach will allow the County to meet its long-term water resource needs and avoid unnecessary projects for restoring and protecting water quality. 2011.
5) Tampa Bay Water Integrated Source Water Protection Plan, Tampa Bay, Florida (Tampa Bay Water). Principal technical scientist responsible for project design, quality assurance, and stakeholder participation. Project involved development of an integrated source water protection plan for protecting public drinking water sources – including groundwater, surface water, and saline sources. The relative effectiveness of the protective measures evaluated was determined using an innovative “expert” survey method to gain consensus on what makes a measure effective. The most effective methods were then evaluated through a cost-benefit analysis, including financial and personnel costs; and water quality, environmental, and social benefits (triple bottom line analysis). 2010.

<u>Federal Financial Application Form</u>s: (Place in appendix if submitting hardcopy, otherwise these are the only documents that may be separate the narrative package)

OMB Number: 4040-0004
Expiration Date: 03/31/2012

Application for Federal Assistance SF-424

* 1. Type of Submission:	* 2. Type of Application:	* If Revision, select appropriate letter(s):
☐ Preapplication	☐ New	
☒ Application	☐ Continuation	* Other (Specify):
☐ Changed/Corrected Application	☐ Revision	Full Proposal Application

* 3. Date Received:	4. Applicant Identifier:
Completed by Grants.gov upon submission.	

5a. Federal Entity Identifier:	* 5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:	7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name:	University of South Florida
* b. Employer/Taxpayer Identification Number (EIN/TIN):	59-3102112
* c. Organizational DUNS:	06-968-7242

d. Address:

* Street1:	3702 Spectrum Blvd.
Street2:	Suite 165
* City:	Tampa
County/Parish:	Hillsborough
* State:	Florida
Province:	
* Country:	USA: UNITED STATES
* Zip / Postal Code:	33612-9445

e. Organizational Unit:

Department Name:	Division Name:
Global Sustainability	

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:		* First Name:	Kalanithy
Middle Name:			
* Last Name:	Valravamoorthy		
Suffix:			

Title: Professor

Organizational Affiliation:

* Telephone Number:	813-974-9694	Fax Number:	
* Email:	valravk@usf.edu		

Application for Federal Assistance SF-424

9. Type of Applicant 1: Select Applicant Type:

H: Public/State Controlled Institution of Higher Education

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Forest Service

11. Catalog of Federal Domestic Assistance Number:

10.675

CFDA Title:

Urban and Community Forestry Program

*** 12. Funding Opportunity Number:**

USDA-FS-UCF-01-2014

* Title:

2014 National Urban and Community Forestry Grant Program

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater Management

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: FL-15 * b. Program/Project: US-All

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 10-1-2014 * b. End Date: 9/30/2016

18. Estimated Funding ($):

* a. Federal	$149,722.00
* b. Applicant	$155,612.00
* c. State	
* d. Local	
* e. Other	
* f. Program Income	
* g. TOTAL	$305,334.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

- [ ] a. This application was made available to the State under the Executive Order 12372 Process for review on .
- [ ] b. Program is subject to E.O. 12372 but has not been selected by the State for review.
- [x] c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

- [ ] Yes
- [x] No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

- [x] ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix:	
* First Name:	Rebecca
Middle Name:	
* Last Name:	Puig
Suffix:	
* Title:	Assistant Vice President
* Telephone Number:	813-974-2897
Fax Number:	
* Email:	Awards @usf.edu
* Signature of Authorized Representative:	Rebecca Puig
* Date Signed:	9/29/14

View Burden Statement

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 06/30/2014

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. NUCFAC 2014 Cost-Share Grant	10.675	$	$	$ 149,722.33	$ 155,612.14	$ 305,334.46
2.						
3.						
4.						
5. Totals		$	$	$ 149,722.33	$ 155,612.14	$ 305,334.46

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) NUCFAC 2014 Cost-Share Grant	(2)	(3)	(4)	Total (5)
a. Personnel	$ 69,353.20	$ 56,988.80	$	$	$ 126,342.00
b. Fringe Benefits	10,268.66	5,405.26			15,673.92
c. Travel	11,550.00				11,550.00
d. Equipment					
e. Supplies	2,000.00				2,000.00
f. Contractual	27,007.50	25,005.96			52,013.46
g. Construction					
h. Other		39,260.00			39,260.00
i. Total Direct Charges (sum of 6a-6h)	120,179.36	126,660.02			$ 246,839.38
j. Indirect Charges	29,542.97	28,952.11			$ 58,495.08
k. TOTALS (sum of 6i and 6j)	$ 149,722.33	$ 155,612.13	$	$	$ 305,334.46
7. Program Income	$	$	$	$	$

SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8.	$ 116,352.13	$	$ 39,260.00	$ 155,612.13
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$ 116,352.13	$	$ 39,260.00	$ 155,612.13

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 149,722.33	$ 37,430.59	$ 37,430.58	$ 37,430.58	$ 37,430.58
14. Non-Federal	$ 155,612.13	38,903.04	38,903.03	38,903.03	38,903.03
15. TOTAL (sum of lines 13 and 14)	$ 305,334.46	$ 76,333.63	$ 76,333.61	$ 76,333.61	$ 76,333.61

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b)First	(c) Second	(d) Third	(e) Fourth
16.	$	$	$	$
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$	$	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: Fed $120,179.36 Non-fed $126,660.02

22. Indirect Charges: Negotiated indirect of 49.5% reduced to 25%

23. Remarks: Difference between full rate of 49.5% and 25% (as approved by USF Research and Innovation) is used as part of cost share.

	Quantity (Hours)	Rate	Fringe	Sallary	Fringe	Total	Funds US Forest	Match Funds	Total
USF									
Shawn Landry						$ 10,000.00	$ 10,000.00	$ -	$ 10,000.00
Shawn's Student						$ 17,758.00	$ 17,758.00	$ -	$ 17,758.00
Rob Northrop UF							$ -	$ 7,000.00	$ 7,000.00
Jochen Eckart PCGS	360	$ 41.67	8%	$ 15,001.20	$ 1,200.10	$ 16,201.30	$ 16,201.30		$ 16,201.30
Jochen Eckart match	480	$ 41.67	8%	$ 20,001.60	$ 1,600.13	$ 21,601.73		$ 21,601.73	$ 21,601.73
Grad Assist PCGS	480	$ 26.90	15%	$ 12,912.00	$ 1,936.80	$ 14,848.80	$ 14,848.80		$ 14,848.80
Seneshaw Tsegaye PCGS	730	$ 26.40	8%	$ 19,272.00	$ 1,541.76	$ 20,813.76	$ 20,813.76		$ 20,813.76
Seneshaw Tsegaye match	760	$ 26.40	8%	$ 20,064.00	$ 1,605.12	$ 21,669.12		$ 21,669.12	$ 21,669.12
Kala Vairavamoorthy match	160	$ 105.77	13%	$ 16,923.20	$ 2,200.02	$ 19,123.22	$ -	$ 19,123.22	$ 19,123.22
Travel PCGS and Shawn							$ 3,372.00		$ 3,372.00
Travel Rob		sallary US	$ 47,185.20				$ 2,580.00		$ 2,580.00
Dissemination Rob		Sallary PCGS	$ 56,988.80				$ 2,000.00		$ 2,000.00
Travel Tom Singleton		fringe US	$ 4,678.66				$ 5,598.00	$ -	$ 5,598.00
Subtotal USF		fringe PCGS	$ 5,405.26				$ 93,171.86		$ 93,171.86
Indirect USF							$ 23,292.97	$ 22,827.11	$ 46,120.07
Total USF							**$ 116,464.83**	**$ 92,221.18**	**$ 208,686.00**
UF									
Andrew Koeser UF	13500	6008					$ 19,508.00	$ 21,549.00	$ 41,057.00
Travel Andrew							$ 2,098.00	$ -	$ 2,098.00
Expenses Andrew							$ -	$ -	$ -
Subtotal UF							$ 21,606.00	$ 21,549.00	$ 43,155.00
Indirect UF							$ 5,401.50	$ 3,456.96	$ 8,858.46
Total UF							**$ 27,007.50**	**$ 25,005.96**	**$ 52,013.46**
Subtotal for Indirect USF							**$ 25,000.00**		
Indirect USF							**$ 6,250.00**	**$ 6,125.00**	**$ 12,375.00**
Total budget required for UF							**$ 33,257.50**	**$ 31,130.96**	**$ 64,388.46**
External Partners									
Charlie Marcus							$ -	$ 600.00	$ 600.00
Tom Singleton							$ -	$ 28,800.00	$ 28,800.00
John McGee							$ -	$ 1,260.00	$ 1,260.00
Milwaukee							$ -	$ 1,000.00	$ 1,000.00
Cathy Coyle							$ -	$ 600.00	$ 600.00
Total Others							**$ -**	**$ 32,260.00**	**$ 32,260.00**
Total							$ 149,722.33	$ 155,612.14	**$ 305,334.46**

3rd party cost share	$ 57,265.96
DSR cost share	$ 28,952.11
College/dept cost share	$ 69,394.07
total direct cost USF	$ 118,171.86

Comments
3 months Jochen's time
Student supporting Jochen and Seneshaw
5 months Seneshaw's time
1 month Kala's time
1 trips to Milwaukee 350 flight + 3*158 + 2 conference $650 flight 3*208
1 trips to washington 300 flight + 2*295 + 1 conference $650 flight 5*208
dissemination material + webinar $2000
1 trips to Milwaukee 350 flight + 3*158 + 1 conference $650 flight 5*208 + 8* trip to t
Match funds provided by reduction indirect cost rate from 49.5% to 25%
Andrew and his student
1 trips to Milwaukee 350 flight + 3*158 + 1 conference $650 flight 3*208
we have only to pay for $25000 indirect cost at USF
Match funds provided by reduction indirect cost rate

external partners + UF

OMB Approval No. 0348-0040

ASSURANCES - NON-CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Rebecca Puig	Assistant Vice President
APPLICANT ORGANIZATION	DATE SUBMITTED
University of South Florida	April 29, 2014

<u>Federal Financial Application Form</u>s: (Place in appendix if submitting hardcopy, otherwise these are the only documents that may be separate the narrative package)

ORIGINAL

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN: 1593102112A1

ORGANIZATION:
University of South Florida
4202 East Fowler Avenue
ADM147
Tampa, FL 33620-5800

DATE:05/08/2013

FILING REF.: The preceding agreement was dated 08/20/2012

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: INDIRECT COST RATES

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

EFFECTIVE PERIOD

TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
PRED.	07/01/2014	06/30/2016	49.50	On-Campus	Organized Research
PRED.	07/01/2014	06/30/2016	26.00	Off-Campus	Organized Research (A)
PRED.	07/01/2014	06/30/2016	27.50	Off-Campus	Organized Research (B)
PRED.	07/01/2014	06/30/2016	46.00	On-Campus	Instruction
PRED.	07/01/2014	06/30/2016	26.00	Off-Campus	Instruction (A)
PRED.	07/01/2014	06/30/2016	27.50	Off-Campus	Instruction (B)
PRED.	07/01/2014	06/30/2016	34.50	On-Campus	Other Sponsored Activities
PRED.	07/01/2014	06/30/2016	26.00	Off-Campus	Other Sponsored Activities (A)
PRED.	07/01/2014	06/30/2016	27.50	Off-Campus	Other Sponsored Activities (B)

TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
PROV.	07/01/2016	Until Amended			Use same rates and conditions as those cited for fiscal year ending June 30, 2016.

*BASE

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first $25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, student tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of $25,000.

(A) Off-campus, remote includes locations outside the commuting distance of Tampa, Florida.

(B) Off-campus, adjacent includes locations within the commuting distance of Tampa, Florida.

ORGANIZATION: University of South Florida
AGREEMENT DATE: 5/8/2013

SECTION I: FRINGE BENEFIT RATES**

TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
FIXED	7/1/2013	6/30/2014	1.10	All	Full Benefits Employees
FIXED	7/1/2013	6/30/2014	0.40	All	Other Personnel Services Employees
PROV.	7/1/2014	Until amended			Use same rates and conditions as those cited for fiscal year ending June 30, 2014.

** DESCRIPTION OF FRINGE BENEFITS RATE BASE:

Salaries and wages.

SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:

Certain fringe benefits are charged using the effective rates(s) listed in the Fringe Benefits section of this Agreement. Retroactive payroll transfers will use the rates in effect at the time of transfer. The fringe benefits included in the rate(s) are listed below.

TREATMENT OF PAID ABSENCES

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims are not made for the cost of these paid absences, except for terminal leave pay which is included in the benefits rate and is paid out after separation of employment.

OFF-CAMPUS DEFINITION: For all activities performed in facilities not owned by the institution and to which rent is directly allocated to the project(s), the off-campus rate will apply. Actual costs will be apportioned between on-campus and off-campus components. Each portion will bear the appropriate rate.

Fringe Benefits include: Worker's Compensation, Unemployment Insurance, and Terminal Leave Pay. Other employee benefits, such as FICA, Retirement, Health Insurance, and Life Insurance, are charged based on actual incurred costs.

Equipment means an article of nonexpendable tangible personal property having a useful life of more than one year. Through 06/30/2011, the threshold was $1,000 or more per unit. Effective 07/01/2011, the threshold is $5,000 or more per unit.

The rates contained in this Agreement reflect the combined cost of the University of South Florida and the University of South Florida Research Foundation, Inc., and will apply to grants and contracts awarded to the Foundation.

** This Rate Agreement updates the Fringe Benefits Rates only. All other terms and conditions per Rate Agreement dated 08/20/2012 are to remain in effect.

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted: such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:

University of South Florida
(INSTITUTION)

Jennifer Condon
(SIGNATURE)

Jennifer Condon
(NAME)

University Controller
(TITLE)

5/21/13
(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES
(AGENCY)

Darryl W. Mayes
(SIGNATURE)

Darryl W. Mayes
(NAME)

Regional Director, Division of Cost Allocation
(TITLE)

5/8/2013
(DATE) 0315

HHS REPRESENTATIVE: Phat Chau

Telephone: (301) 492-4855

Statement of Key Personnel Qualifications

A brief description of the experience of senior personnel and a description of resource adequacy is provided below. An abbreviated biosketch or resume for each personnel is included toward the end of the appendix in the Senior Personnel Support Documents section.

Kalanithy Vairavamoorthy, is an internationally-recognized expert on water resource management and urban water systems. His main research areas are in the design, operation and management of integrated urban water systems operating under future global change pressures and its implications to water governance issues. He is Professor at the Patel College of Global Sustainability at the University of South Florida. Dr. Vairavamoorthy is also Professor of Sustainable Urban Water Systems at UNESCO-IHE and TUDelft, in the Netherlands. Prior to moving to the United States, he was the Director of SWITCH, a €25M EU research project for Sustainable Water Management for the City of the Future, which is one of the largest EU research projects in the area of water. A major output of the SWITCH project is the "The SWITCH Transition Manual: Managing Water for the City of the Future" which focused on the transition process towards integrated urban water systems in the city of the future. He Co-Chairs IWA's 'Cities of the Future' program and has a strong international profile of working closely with the World Bank, UN-Habitat, UNEP, UNESCO-IHP, IWA and the European Union. Dr. Vairavamoorthy supervised a PhD thesis at the University on Birmingham on the "Transitioning of Urban Water Distribution Systems". He has published more than 80 peer-reviewed papers in academic journals and conference proceedings, published 2 books, edited 3 books, and given more than 50 keynotes in high impact international conferences. Dr. Vairavamoorthy will serve as PI on the project to oversee, direct and coordinate the project team of the proposed research plan. Dr. Vairavamoorthy will provide technical expertise in the areas of transitioning, urban drainage r systems modeling and water systems optimization.

Jochen Eckart is a senior research fellow (visiting Assistant Professor as of August 2013) at the Patel College of Global Sustainability at the University of South Florida. He is doing interdisciplinary research and policy advice in the field of sustainable and resilient cities with a focus on sustainable urban drainage systems. He did his Ph.D. in Civil and Environmental engineering with the concentration water resources at the University of South Florida and has a Dipl.-Ing. degree (MSc.) in Spatial and Environmental Planning from the University of Kaiserslautern, Germany. His Ph.D. research was on the flexibility of urban drainage systems against future change drivers. From 2006 to 2010 he worked in the EU 6th Framework research project 'SWITCH Managing Water for the City of the Future' in the area of 'Water Sensitive Urban Design' and 'Sustainable Urban Drainage Systems'. As CO-PI he will be responsible to develop the catalogue of green drainage options, will contribute to the creation of the different GIS tools, will develop the transitional framework and will lead the development of the handbook and guidelines.

Shawn Landry is a Research Associate Professor and Program Director of the Florida Center for Community Design and Research at University of South Florida. Landry has a Master's in Botany, a Master's in Management Information Systems, and a Ph.D. in Geography and Environmental Science and Policy (as of August, 2013). Landry has facilitated interdisciplinary applied research as Director of the Florida Center for Community Design and

Research since 2003, where he was responsible for budget management, strategic planning, supervising research faculty, technical staff and students, hiring of faculty and other personnel, and management of all facilities. As a PI on over $8 million in total grant and contract funding since 1998, Landry has been responsible for budget allocations, project management, technology transfer and community engagement, spatial and parametric database development, remote sensing and spatial analysis, writing of peer-reviewed articles and project reports, and hiring of staff. He led several applied projects (total funding $1.1m) that provided technical transfer assistance and GPS/GIS mapping of urban water, sewer and stormwater infrastructures. As founder and Co-Principal Investigator for the Water Atlas Program (www.wateratlas.org), he managed a multi-year, multi-sponsor project ($8.7m total funding to-date) to develop and maintain a web-based water resources decision support and informatics software application that provides access to long-term data of the type proposed for use in the existing grant proposal. He also developed and manages the Plant Atlas program (www.plantatlas.org), a nationally appropriate web-based tool for managing plant specimen and distribution information. Landry's expertise in urban forest issues is demonstrated by his involvement as Co-PI on several projects since 1996 that included tree canopy mapping, ecosystem services estimation, management plan development, and environmental equity analysis. Shawn Landry will draw on his experience and expertise in infrastructure and urban forest mapping, technical transfer and applied research, decision support system development, and project management to assist in the development and testing of transitioning tools and compilation of the final deliverables.

Andrew Koeser is an Assistant Professor of Landscape Management at the University of Florida. He an International Society of Arboriculture (ISA) Board Certified Master Arborist, two-time recipient of the Garden Club of America Urban Forestry Fellowship, current member of ISA Science and Research Committee. Prior to working as an academic, Dr. Koeser served as Science and Research Manager at ISA, producing educational and outreach materials for various audiences including: certification study materials, trade publications, conference programming, and best management practices. Past efforts most pertinent to this project include a series of interactive computer-based training modules and the Arborists' Certification Study Guide. Andrew Koeser will assist in the development of the catalogue of green drainage options, will support the application of the finalized tools in the case study in WI, will assist in the creation of a user manual and tutorials and will contribute to the dissemination and outreach efforts.

Seneshaw Tsegaye is a senior research fellow at the Patel College of Global Sustainability at the University of South Florida. Tsegaye did his M.Sc degree in Integrated Urban Engineering from UNESCO-IHE, Institute for Water Education, The Netherlands and Ph.D. in Civil and Environmental engineering with the concentration water resources at the University of South Florida. Prior to joining the University of South Florida, he worked as a researcher at University of Birmingham, United Kingdom and has been involved with multiple projects related to urban water management. His research areas are integrated urban water management as well as resilient and adaptive infrastructures. His current research focus is Flexible Water Systems that are capable to adapt to the future change pressures and associated uncertainties. He has more than 10 years' experience in developing simulation and optimization models for urban water systems (water supply and urban drainage). He has strong experience in programing languages such as C++, C#, MATLAB, Fortran, Java, Python, Basic. He has developed his own 2D flood modeling tool and coupled with Strom Water management Model

(SWMM), Optimization for flexible water systems, agent based model for demand management strategy, clustering tool for integrated urban water systems, and flood damage evaluation tool. He will be responsible to develop of the optimization tool for the combination of gray and green infrastructure systems.

Robert Northrop is the extension forester for the University of Florida IFAS Extension. The focus of his work involves teaching urban and community forestry to natural resource and landscape professionals; and providing conservation planning assistance to local, state and federal governments and community associations. His work in the analysis of societal benefits from urban and semi – natural forests in the Tampa Bay watershed over the last eight years has led to the adoption of a comprehensive urban forest plan by the City of Tampa. Before coming to Florida he worked as the technical watershed forester for the State of Maryland's Chesapeake Bay Restoration Program, served as Director of the Governor's Executive Committee on Trees and Forests in Maryland for forest and wildlife policy, and taught wildlife management at the University of Delaware. Recently, Mr. Northrop managed a two-year project that developed of a framework for sustainable urban forest management and required facilitation of numerous workshops with a diverse number of public and private stakeholders within the City of Tampa, Florida. Robert Northrop will lead the dissemination and outreach efforts of the project and will facilitate the Project Advisory Committee.

Tom Singleton is the president of Thomas L. Singleton Consulting, Inc. He is a biologist by training and a water resource planner by practice with over 35 years of experience in both the public (17 years) and private (18 years) sectors. He is a recognized and nationally published expert in water quality restoration, TMDLs, and watershed planning. As the statewide TMDL coordinator for the Florida Department of Environmental Protection, he developed the policy and guidance for implementing the nationally recognized TMDL program in Florida. As a private consultant, Tom specializes in helping local governments develop and implement sustainable water resource management plans for urban settings that actively incorporate green infrastructure. He is especially adept at integrating science, planning, and engineering to retrofit the water infrastructure of entire communities. In addition to providing technical, policy, and financial guidance, Tom is strongly committed to helping communities build stakeholder consensus and support for their projects. He brings practical and applied experience to this project. He will support the development of the decision-support prioritization tool and the testing of the complete toolset in the Tampa, Hillsborough County, Florida, and Milwaukee, Wisconsin case studies.

U.S. DEPARTMENT OF AGRICULTURE

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989 Federal Register (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) have not within a three-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

University of South Florida — Organization Name

Gray to Green: Tools for Trai — PR/Award Number or Project Name

Rebecca Puig, Assistant Vice President — Name(s) and Title(s) of Authorized Representative(s)

Rebecca Puig — Signature(s)

04/29/2014 — Date

Form AD-1047 (1/92)

Instructions for Certification

1. By signing and submitting this form, the prospective primary participant is providing the certification set out on the reverse side in accordance with these instructions.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out on this form. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

4. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.

6. The prospective primary participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this form that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

U.S. DEPARTMENT OF AGRICULTURE

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, *Federal Register* (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency with which this transaction originated.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

University of South Florida	From Gray to Green: Tools for Transitioning to Vegetation-Based Stormw
Organization Name	PR/Award Number or Project Name
Rebecca Puig, Assistant Vice President	
Name and Title of Authorized Representative	
Rebecca Puig	04/29/2014
Signature	Date (mm/dd/yyyy)

Form AD-1048 (2/89)
This form was electronically produced using Applix 4.41

INSTRUCTIONS FOR CERTIFICATION

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms ``covered transaction,'' ``debarred,'' ``suspended,'' ``ineligible,'' ``lower tier covered transaction,'' ``participant,'' ``person,'' ``primary covered transaction,'' ``principal,'' ``proposal,'' and ``voluntarily excluded,'' as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled ``Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions,'' without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participating in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

OMB APPROVAL NO. 0991-0002

U.S. DEPARTMENT OF AGRICULTURE

CERTIFICATION REGARDING
DRUG-FREE WORKPLACE REQUIREMENTS (GRANTS)
ALTERNATIVE I - FOR GRANTEES OTHER THAN INDIVIDUALS

This certification is required by the regulations implementing Sections 5151-5160, of the Drug-Free Workplace Act of 1988 (Pub. L. 100-690, Title V, Subtitle D; 41 U.S.C. 701 et seq.), 7 CFR Part 3017, Subpart F, Section 3017.600, Purpose. The January 31, 1989, regulations were amended and published as Part II of the MAY 25, 1990, Federal Register (pages 21681-21691). Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the grant.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

Alternative I

A. The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about --

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a):

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --

(1) Abide by the terms of the statement; and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notify the agency in writing, within 10 calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position, title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, State, zip code)

4202 E. Fowler Ave. Mail Point: CGS 101

Tampa, FL 33620

Check ☐ if there are workplaces on file that are not identified here.

University of South Florida | Gray to Green: Tools for Transitioning to Vegetation-Based Stormwater M

Organization Name | Award Number or Project Name

Rebecca Puig, Assistant Vice President

Name and Title of Authorized Representative

Rebecca Puig | 04/29/2014

Signature | Date

Instructions for Certification

1. By signing and submitting this form, the grantee is providing the certification set out on pages 1 and 2.

2. The certification set out on pages 1 and 2 is a material representation of fact upon which reliance is placed when the agency awards the grant. If it is later determined that the grantee knowingly rendered a false certification, or otherwise violates the requirements of the Drug-Free Workplace Act, the agency, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

3. Workplaces under grants, for grantees other than individuals, need not be identified on the certification. If know, they may be identified in the grant application. If the grantee does not identify the workplaces at the time of application, or upon award, if there is no application, the grantee must keep the identity of the workplace(s) on file in its office and make the information available for Federal inspection. Failure to identify all known workplaces constitutes a violation of the grantee's drug-free workplace requirements.

4. Workplace identifications must include the actual address of buildings (or parts of buildings) or other sites where work under the grant takes place. Categorical descriptions may be used (e.g., all vehicles of a mass transit authority or State highway department while in operation, State employees in each local unemployment office, performers in concert halls or radio studios).

5. If the workplace identified to the agency changes during the performance of the grant, the grantee shall inform the agency of the change(s), if it previously identified the workplaces in question (see paragraph three).

6. Definitions of terms in the Nonprocurement Suspension and Debarment common rule and Drug-Free Workplace common rule apply to this certification. Grantees' attention is called, in particular, to the following definitions from these rules:

``Controlled substance'' means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. 812) and as further defined by regulation (21 CFR 1308.11 through 1308.15);

``Conviction'' means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes;

``Criminal drug statute'' means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, use, or possession of any controlled substance;

``Employee'' means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all ``direct charge'' employees; (ii) all ``indirect charge'' employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if sued to meet a matching requirement; consultants or independent contractors not on the grantee's payroll; or employees of subrecipients or subcontractors in covered workplaces).

OMB Approval No. 0348-0040

ASSURANCES - NON-CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
Rebecca Puig	Assistant Vice President
APPLICANT ORGANIZATION	DATE SUBMITTED
University of South Florida	April 29, 2014

DISCLOSURE OF LOBBYING ACTIVITIES

Approved by OMB
0348-0046

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure.)

1. Type of Federal Action:
[b] a. contract
b. grant
c. cooperative agreement
d. loan
e. loan guarantee
f. loan insurance

2. Status of Federal Action:
[b] a. bid/offer/application
b. initial award
c. post-award

3. Report Type:
[a] a. initial filing
b. material change
For Material Change Only:
year _____ quarter _____
date of last report _____

4. Name and Address of Reporting Entity:
[x] **Prime** [ ] **Subawardee**
Tier _____, *if known*:
University of South Florida
4202 E. Fowler Ave
Tampa, FL 33620
Congressional District, *if known*: 4c FL-015

5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime:
Congressional District, *if known*:

6. Federal Department/Agency:
US Forest Service

7. Federal Program Name/Description:
2014 National Urban and Community Forestry Challenge Cost-Sha
CFDA Number, *if applicable*: 10.675

8. Federal Action Number, *if known*:

9. Award Amount, *if known*:
$

10. a. Name and Address of Lobbying Registrant
(*if individual, last name, first name, MI*):
n/a

b. Individuals Performing Services (*including address if different from No. 10a*)
(*last name, first name, MI*):

11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signature: Rebecca Puig
Print Name: Rebecca Puig
Title: Assistant Vice President
Telephone No.: 813-974-2897 Date: _____

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Standard Form LLL (Rev. 7-97)