I. Project Information*

Project Director	Ping Wang
Project Title	Community-Based Design using Nature-Based Solutions to Meet Climate Change Challenges along Urban Hillsborough River, Tampa
Project Location	City of Tampa, Florida
Project Summary	Three sites along the urbanized Hillsborough River in Tampa, Florida are selected for the design of nature-based solutions (NBS) to meet pressing climate-related challenges. All three sites are popular Tampa city parks serving large at-risk and under-resourced communities. A multi-disciplinary team composed of University of South Florida researchers, City of Tampa staff, and consultants is assembled to design the NBS. The three sites are exposed to different climate-related hazards. Site 1 is low-lying and highly vulnerable to submergence by sea-level rise and storm surge, along with shoreline erosion by wind- and boat-generated waves. Site 2 is suffering from aggressive riverbank erosion due to strong flow, along with large un-treated stormwater discharge. Site 3 is directly downdrift of the river dam with deteriorating stormwater structure, in addition to riverbank erosion and flooding related to water release at the dam. Three corresponding general NBS approaches including artificial reef plus constructed wetlands for Site 1, constructed wetlands plus pond/stream and shoreline stabilization for Site 2, and stream daylighting and wetlands for Site 3 will be introduced to the community. We will conduct lived experience engagement with the communities through opinion survey, focused group discussion, and workshops with discussion. The goal of this project is to design the NBS based on the above three concepts through constructive and iterative community engagement. The final NBS design will embody community acceptance and ownership. In addition, the consultants will ensure that the NBS design has adequate technical drawings and accurate cost estimate to seek implementation funding.

II. Executive Summary

To support bridging knowledge to action, the GRP seeks to develop products that are widely accessible and useful to communities, academics, non-governmental organizations, and public and private decision-makers. GRP Executive Summaries are designed to communicate, in clear and non-technical language, what issues GRP has supported, what was done, and what was achieved.

Responses must be written in complete sentences rather than in bullet point.

1. What problem are you addressing, and why does it matter? (up to 100 words) *

Briefly describe the issue your project is tackling. Why is this problem significant to the Gulf region, its communities, ecosystems, or systems of practice?

The three project sites are popular Tampa city parks serving large at-risk and under-resourced communities. The three sites are exposed to climate-related hazards differently as illustrated by the impacts of Hurricanes Helene and Milton in 2024. This project addressed impacts of severe compound flooding to communities and ecosystems. The communities suffered life-threatening flooding caused by record-breaking storm surge induced by Helene and record-breaking rainfall by Milton. Compound flooding constitutes a major problem for the low-lying Gulf region. Three corresponding community-based NBS projects were designed. The knowledge learned and the products from this project are applicable to the broad Gulf region.

2. What did you do? (up to 500 words) *

Summarize your key activities and outputs during this period (or planned for the project). Program activities are the actions a program takes (e.g., conducting field research, holding workshops, analyzing data, providing training, building partnerships), while outputs are the direct, tangible products or results of those actions (e.g., number of partnerships established, models created, workshops held, students trained).

Key activities during this 24-month project (18 months original duration plus six months no-cost extension include 1) field data collection, 2) workshops and presentations, 3) data analysis and numerical modeling, 4) post-doc and graduate student training, 5) NBS project design at the three sites, and 6) partnership building. These activities generated a wide range of outputs and subsequently resulted in the community-based design of park-scale NBS projects at the three popular City of Tampa parks.

The outputs of the field data collection include 1) a detailed digital bathymetry and topographic map for the studied section of the Hillsborough River, 2) a 2-month flow dataset measured at a strategic location, and 3) stratified salinity regimes for both dry and wet season.

The outputs of workshops and presentations include 1) two focus group discussions, 2) two community design workshops, 3) 72 opinion surveys, 4) four community outreach events, and 5) four presentations to the Hillsborough River Board.

The outputs of data analysis and numerical modeling include 1) tidal- and river- (dam water release to be exact) driven flow regime, 2) a calibrated numerical model simulating the tidal- and river-driven flow field, 3) extreme water levels generated by record-breaking Hurricane Helene induced storm surge and record-breaking Hurricane Milton induced heavy rainfall, and 4) a calibrated numerical model simulating the compound flooding that can be generated by storm surge and heavy rainfall.

The outputs of post-doc and graduate student training include 1) training of a post-doc scholar who became a tenure-track assistant professor of environmental sciences at the University of Tampa (started August 2025), and 2) training of five graduate students on community outreach and data collection, field data collection, and numerical modeling.

The outputs of the project design include 1) collection and assimilation of existing site data including reports, topographic data, drainage basin maps, above and below ground utilities information, existing record drawings, geotechnical reports, and existing environmental resource permits, 2) project alternatives design and drafting, and utility review coordination, 3) conducting regulatory permitting review and attending pre-application meetings with key agencies, and 4) engineering drawings and revisions based on comments/suggestions from the agencies.

The outputs of partnership building include 1) numerous meetings with relevant departments within the City of Tampa, 2) partnership with the City of Tampa Park and Recreation Department in seeking implementation funding, and 3) meetings with key regulatory agencies, one for each project site, including Southwest Florida Water Management District, Hillsborough County Environmental Protection Commission, Florida Department of Environmental Protection, and US Army Corps of Engineers.

During the six months no-cost extension, the entire project team worked closely with all the partners and communities to revise the NBS design and seek implementation funding for the proposed design. Many of the above activities were repeated to collect post-storm data and explore funding opportunities associated with post-storm recovery efforts.

3. What did you achieve? (up to 500 words) *

What were the outcomes or impacts of your work so far? What changed or advanced as a result of your activities—whether in knowledge, people, communities, policies, or systems? Outcomes and impacts are the changes that result from your work—such as increased knowledge, improved decision-making, strengthened community capacity, policy influence, or environmental improvements. For example, your work might lead to new coastal planning practices, or your engagement efforts might help communities better prepare for climate risks. Your education programs might have inspired students to pursue careers focused on Gulf issues or increased their commitment to staying and working in Gulf communities.

The outcomes of this project include datasets on physical characteristics of the heavily urbanized Hillsborough River, community perceptions on climate challenges, community experiences on impacts of two extreme hurricanes within two weeks, community priority and contributions to the design of three NBS projects, engineering design of the projects, pre-permitting discussions with regulatory agencies and revision of the designs, inputs from engagements with various stakeholders, and seeking implementation funding taken advantage of post-hurricane restoration opportunities.

Most of the 72 opinion surveys were obtained via in-person events. Financial constraint and lack of public support ranked the highest, 31.0% and 28.2%, respectively, in hurdles that prevent adaptation measures to combat long-term shifts in temperature and weather patterns. For flooding, although 57.7% of the participant indicated that they do not have flooding issues versus 31.0% that have, 49.3% keep supplies in case of flooding. The focus group discussion revealed that riverbank erosion, deterioration of aging river-walls, and poor water quality as the top concerns. The top concerns during the post-hurricane focus-group discussion are: 1) lack of community cohesion during pre-storm preparation and post-storm recovery, 2) flooding in the neighborhood not just individual homes, and 3) damage caused by falling trees.

The key finding from the community design workshops is that park amenities such as walking trails, playgrounds, and water access – dock/kayak launch constitute the top features. Consultations with various regulatory agencies revealed certain limitations. For example, features extending into the river such as artificial reefs and docks/kayak launches would complicate and prolong the permitting process. The final design at all three sites reflects all the above outcomes.

At Riverside Garden Park (site 1) near the entrance to Tampa Bay, nutrients/debris input from a large untreated stormwater drain and riverbank erosion constitute the major issues. A detached artificial reef system combined with constructed wetlands were designed to protect the riverbank and to absorb nutrients and trap debris from the stormwater drain directly upstream.

At the historic River Tower Park (site 2) in the middle stream, the main concerns are the large treeless field and nutrients input from a large untreated stormwater drain. The community participated most actively in the NBS design at this park. The design included constructed wetlands for stormwater treatment, boardwalks and other amenities over the wetlands, and docks and kayak launches. The latter two resulted directly from the community design workshops.

At Rowlett Park (site 3) directly downdrift of the dam, the main concern is nutrients input from a large untreated stormwater drain (a buried stream). The final design included daylighting the buried stream and construction of wetlands/ponds for stormwater treatment.
All three designs were presented to the City of Tampa Parks and Recreation Department. The River Tower Park NBS design was selected and submitted for post-hurricane restoration and is currently ranked #1 amount 25 projects.

The direct impact of this project is the three shelf-ready park-scale NBS projects. The indirect longer-term impacts include community education on NBS and establishment of a large network for future climate resilience building.

4. What's next? (up to 100 words) *

What are your next steps or priorities based on what you've learned? Share any anticipated shifts in direction, upcoming efforts, or recommendations for others working on similar issues.

The next steps include but not limited to 1) continue to work with the communities on all river-related environmental issues taking advantage of the active network that was established, 2) closely monitor the progress of River Tower Park project, currently ranked #1 for the City of Tampa post-hurricane restoration projects, and be ready to furnish any information request, 3) continue to seek funding opportunities for the other two shelf-ready NBS projects at River Garden Park and Rowlett Park, and 4) publish findings in peer-reviewed journals and presenting at regional, national and international conferences, with two papers currently under review.

5. Activity Location *

Please fill out the following chart with the relevant locations for your project work using this form.

Progress__Annual_Report_Activity_Location.xlsx

Filename: Progress__Annual_Report_Activity_Location.xlsx **Size:** 15.7 kB

6. Per your approved Data Management Plan, are you expected to submit data? *

Yes

Submit Data Management Project Personnel

Any project members who will be submitting data to GRIIDC must have their own account at GRIIDC that is linked to your current grant project. To facilitate GRIIDC account set-up and ensure you are prepared for the required Dataset Information Form (DIF) submission, the GRP will send the information in the below form to GRIIDC directly.

Key Personnel *

The project's Data Manager and any other key personnel who will be interacting with GRIIDC should be listed in the form below.

	Role of the Project Member	Full Name	Email	Organizational Affiliation
Key Personnel 1	Project Director	Ping Wang	pwang@usf.edu	University of South Florida
Key Personnel 2	Data Manager	Kendal Jackson	kendaljackson@ut.edu	University of Tampa
Key Personnel 3				

Accounts can be requested later for individuals who are not listed in the form, but they will not be able to edit or upload datasets until they have an account.

1. Set up your GRIIDC Account *

1. Each data management project member should first set up their account at this link. https://grp.griidc.org/account
2. Each user should have their own account and accounts should not be shared. If a user already has an account but has forgotten their password, they can reset it here: https://grp.griidc.org/account/reset-password

2. Submit Dataset Information Form (DIF) *

1. All grant projects that will produce data should submit a dataset information form (DIF) within 6 months of the start of funding, even if your data will be archived elsewhere. This assists the GRP with monitoring future submissions.
2. DIF submission can be found at: https://grp.griidc.org/dif
3. Please submit a DIF for every dataset you anticipate will result from your project. They do not have to be exact, as they can be edited or deleted later depending on the actual project results. Additional DIFs can also be submitted later if more or different datasets result from your project.

Review DIF and Data Uploads *

Please confirm that you have added or edited any Dataset Information Forms (DIF) as necessary on the GRIIDC website and/or uploaded any datasets that have been finalized since your last progress report. Datasets must be publicly accessible and linked to GRIIDC by the end date in your full grant Period of Performance.

Yes, I can confirm

III. Progress Report Questions

Please feel free to expand on your answers from the Executive Summary.

1. Please revisit your proposal and review your goals and the outcomes you were seeking to achieve through this grant. How successful were you in meeting your goals? Please assess your success against the criteria you set in your proposal and use any combination of anecdotes, stories, graphs, charts, visuals as well as data to explain your success. Upload supporting files if you choose.*

The overall goal of the proposed project was to productively engage riverfront at-risk communities in the design of scientifically rigorous and practically feasible NBS to meet the challenge of climate-related hazards. This overarching goal was accomplished via seven tasks and objectives. During the study period, the project area was impacted by two extreme hurricanes, Helene with record-breaking storm surge and Milton with record-breaking heavy rainfall. The hurricanes vividly demonstrated life-threatening climate-related risks and provided a rare opportunity to include real extreme climate hazards in all seven tasks. Furthermore, the hurricanes offered opportunities for securing funding for the NBS project implementation. The NBS project design for one of the three project sties, River Tower Park, is ranked as #1 out of 25 projects recommended for Hazard Mitigation Grant Program (HMGP) – FEMA 4828-DR-FL (Hurricane Helene).

The seven proposed tasks/objectives are reproduced in the following, along with a brief summary of our achievements and lessons learned. A PowerPoint presentation file is uploaded to illustrate our outcomes.

Task 1) Establishing efficient procedures to identify and engage at-risk communities, and various stakeholders;

We worked closely with Mr. Frank Crum, City of Tampa's Community Engagement Coordinator - Neighborhood & Community Affairs. Through Mr. Crum, we were able to efficiently and effectively connect to neighborhoods and communities to identify and engage them on relevant climate hazards. The key lessons-learned include a productive relationship with existing community engagement infrastructure at the City of Tampa.

Task 2) Distinguishing different types of and quantifying the causes of climate-related hazards along different stretches of the river;

The different types of climate-related hazards were distinguished and quantified using a) the field data collected by this project and historical data obtained through literature research, b) numerical models constructed by this project, and 3) communications with relevant communities.

Task 3) Building capacity by educating the community on the hazards and stewardship;

We built an active network of citizens, communities, stakeholders, and decision makers on issues related to Hillsborough River. We have developed, presented, and distributed a variety of educational materials on climate-related hazards and stewardship. The network and materials played a significant role in the design of the NBS projects at the three City park sites.

Task 4) engaging the community through lived experiences toward the community-based design of site-specific adaptive NBS;

Two focus-group discussions (27 total participants) and two design workshops (total 46 participants) were conducted. Numerous presentations and informal discussions were conducted at neighborhood association meetings and activities. These meetings played an essential role in attracting focus group and design workshop participants. The design workshops contributed significantly to the final NBS design, e.g., incorporating park amenities in the NBS design. Pre-permitting meetings, one for each site, were conducted with relevant regulatory agencies.

Task 5) designing the NBS;

The shelf-ready engineering design of the NBS project was led by the practitioners from our consulting team, incorporating the inputs from the entire team and stakeholders. Active participation of practitioners is the key lessons learned.

Task 6) repeating tasks 4 and 5, and revising the NBS design;

This iterative process ensures the community-based NBS design.

Task 7) broadly promoting the NBS design and actively seeking funding for implementation.

The final NBS design at River Tower Park was recommended for post-hurricane recovery funding, currently ranked at #1 out of 25 projects. Potential funding sources for the NBS design at the other two parks are being explored.

Optional File Upload

Hillsborough River_project_summary.pptx

Filename: Hillsborough River_project_summary.pptx **Size:** 167.4 MB

2. How has your work benefited your organization, professional field, community, or other stakeholders? *

A group of researchers from diverse disciplines in my organization, the University of South Florida, contributed and benefited from this project. Several programs conducting Gulf and nature-based solutions research were strengthened in terms of research expertise and productivity, scientific publishing and conference presentations, undergraduate and graduate education. This project contributed significantly to the promotion of one faculty member. One post-doctoral scholar, Dr. Kendal Jackson, gained valuable experiences from this project that led to a tenure-track position at the University of Tampa and will continue to conduct research and education on environmental sciences along Hillsborough River and Tampa Bay.

Five graduate and several undergraduate students participated and were supported by this project. The research on compound flooding led to a paper submitted to a peer-reviewed journal (currently under review), with a Ph.D. student as the lead author. Other graduate and undergraduate students gained valuable internship experience on community engagement.

The contributions to the professional field are reflected in scientific publications (forthcoming) and presentations at several regional, national and international conferences. If implemented, with one of the projects having a high possibility of receiving funding, our NBS projects will be one of the few large park-scale projects in heavily urbanized recreational parks along the Gulf coast.

In addition to the planned community engagement activities, we also assisted in various other activities. We assisted the Stepping Stones Community Center, where many of our outreach activities were conducted, to remove invasive species and plant native species, as well as the Center's after-school programs. The data we have collected, specifically the alteration of a natural wetlands, helped a river-front community in stopping an aggressive and dense housing development project. This story is covered by Tampa Bay regional news media (Tampa Bay Times).

Our four presentations at the Hillsborough River Board, a consortium of various local, state, federal, NGO agencies, updated the decision makers on our Hillsborough River NBS project. We provided the City of Tampa, as well as Hillsborough County, with three shelf-ready NBS projects for three heavily used river-front parks. Our NBS project at River Tower Park was recommended for implementation funding from the post-hurricane (Helene) efforts, currently ranked at #1 out of 25 proposed projects.

3. Are there any other successes related more broadly to this project that you would like to share with us? *

Due to the success of this project, our research team has established a reputation as experts in NBS. We applied for NBS-related research funding from various agencies including GRP, NSF, and local governments, with some success. We believe that our research approach, as described throughout this report, is a successful one and plan to continue our NBS research and education. We have also established a close relationship with the larger Gulf-region and national network on NBS and plan to expand our research programs via collaboration with the larger community.

4. What did you learn (positive or negative) as a result of this grant? What lessons would you share with other organizations or the field at large? *

We have learned numerous positive lessons during this project, as described throughout this report. The Sustainability Office at the City of Tampa played a crucial role in connecting our project team with various City of Tampa's departments.

One of the major issues, as mostly identified by the practitioners in our consulting team, is the importance of connecting NBS project development with the funding silos and maintenance capabilities within the municipality. Specifically for Tampa, NBS projects do not quite fit into the main and routine duties of any department. This is a major hinderance toward implementation of Nature Based Solutions. For example, the NBS projects developed by this study are closely related to stormwater management. However, the City's stormwater department is reluctantly willing to do the project unless all the fundings are coming from outside sources, which is fortunately the case for the River Tower Park NBS project. Furthermore, if implemented, the stormwater department will not conduct the necessary routine maintenance. The maintenance will rely on the Parks and Recreation Department that has limited resources to do so. The severely limited resources are the main reason that the Parks and Recreation Department was only able to recommend one of the three NBS projects.

In summary, a major challenge we encountered on implementation of NBS projects is that NSB, by nature, crosses the boundaries of existing municipality organizations. We believe this challenge is common for NBS projects. Working with various departments within a municipality is quite time-consuming. We recommend starting this process as early as possible. Our regular presentations at the Hillsborough River Board played a crucial role in introducing and updating our project and activities to various departments.

5. How do you characterize your relationship with the GRP and what suggestions do you have for improvement? *

Our relationship with the GRP is smooth and successful. We requested a no-cost extension due to the impact of the hurricanes. We made some minor adjustments to the budget categories. All the above issues were resolved efficiently. We do not have any suggestions at this point. We wish we will have opportunities to work with GRP in the future.

6. Please provide any other feedback or comments you have for the GRP. *

We do not have any other feedback or comments at this time.

7. If applicable, please identify and describe the ways you or your organization leveraged GRP's grant (e.g., other funders, volunteers who worked on the program, in-kind donations etc.) Please specify the value and/or number/hours of volunteers if possible.

My organization, the University of South Florida, provided routine and necessary support on research management and compliances. There were no in-kind donations. We did not track the hours of student volunteers. They received internship credits, both directly and/or indirectly. The research team leveraged this GRP grant, indirectly, in applying for similar grants from other funding agencies.

8. NBS Project Plan and Design

Please submit your NBS Project Plan and Design. For more details, please refer to the RFA (pages 4 and 5).

Hillsborough_River_NBS_project_design.pdf

Filename: Hillsborough_River_NBS_project_design.pdf **Size:** 24.9 MB

8. NBS Post-Design Learning and Analysis Documentation

Please submit your NBS Post-Design Learning and Analysis Documentation. For more details, please refer to the RFA (pages 4 and 5).

NBS post design learning and analysis.pdf

Filename: NBS post design learning and analysis.pdf **Size:** 55.1 kB