STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
GRANT WORK PLAN
DEP AGREEMENT NO.: R1820

ATTACHMENT 3

Project Title: An Assessment of Coastal Vulnerability Due to Sea-level Rise and Storminess, Sanibel

Grantee Contact Information

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FEID No.: **65-0753801**

DUNS No.: **834477051**

Project Summary

Location: City of Sanibel, Sanibel Island, Lee County, Florida

Project Summary*:* The City of Sanibel and scientists from FGCU (Drs. Michael Savarese and Felix Jose) will conduct an analysis of Sanibel's vulnerability as a consequence of sea-level rise and increased storminess. The analysis will: (1) engage local stake holders, and (2) describe recent alterations to the coastal landscape, both as prelude to a subsequent computer modeling effort. The first will be accomplished through a series of public meetings and focused, facilitated forums. The second will document the history of beach and dune habitat alteration between 1970 and the present through the production of digital elevation models and from archived beach profiles. These data will identify those coastline segments most susceptible to surge and inundation.

Project Description:

The Southwest Florida region has only recently drawn its attention to the potential effects of climate change-induced sea-level rise (SLR) and increased storminess. Collier County, to Sanibel's south, has undertaken a risk vulnerability assessment with support from funding from NOAA (Sheng, Savarese et al., 2017) and is currently developing an RFP for adaptation planning. The City of Punta Gorda, to Sanibel's north, has conducted an analysis of risk potential and used those results to adjust their comprehensive planning efforts (Beever et al., 2009). Lee County, however, has been remiss, though conversations will begin with civic leaders later this month (FGCU Forum, 2018). The City of Sanibel has maintained a vigilant approach to environmental management and planning through the Sanibel Plan—a Comprehensive Land Use Plan based on natural systems. Their Mayor and City Council are desiring a more proactive, community-based assessment and planning process, and the City welcomes this proposed work. We are hoping this project will not only help the island, but also serve as a role model for the rest of Lee and Charlotte Counties.

The Sanibel Plan, the City of Sanibel's Comprehensive Land Use Plan, takes a novel approach to land use planning, which puts natural resources at the top of its hierarchy of community values. As a result, the community has conserved more than two-thirds of the entire island for protection of wildlife and wildlife habitat. The Sanibel Plan establishes strict limits on impervious coverage and clearance of natural vegetation. It also prohibits or limits the use of hardened structures in the Gulf Beach and Bay Beach Zones, respectively. These elements of the Sanibel have helped reduce the potential risk to private and public infrastructure and have put the City in a better position to deal with the future impacts of SLR.

The City is currently in the process of updating several planning documents to incorporate the impacts of SLR. The City recently incorporated a SLR component into the Sanibel Stormwater Management Plan (June 2017) and the Sanibel Island Wide Beach Management Plan (Draft Update September 2018). The City is working towards full compliance with the 2015 Peril of Flood legislation, and this project will provide planning tools necessary to be compliant with the statute. The City has also completed several beach dune restoration and living shoreline projects to enhance the community's coastal resilience. These projects include the restoration of several miles of beach dune and coastal scrub habitat and construction of two living shoreline projects along the bayside of the island. Another living shoreline, which extends along 1,000 linear feet of shoreline, has recently been designed and permitted and is currently out for bid. The City is also one of three pilot communities in a National Academies of Science Gulf Research Program grant obtained by The Nature Conservancy to investigate *Enhancing community resilience by linking conservation and restoration with coastal hazards risk reduction via the FEMA Community Rating System*. The goal of the project is to improve the capacity of Nature Conservancy staff in the coastal U.S. to work jointly with communities to use science and tools to identify and develop nature-based projects that can enhance resilience to storms and SLR and potentially earn FEMA CRS points. Despite these efforts, a comprehensive vulnerability assessment has yet to take place.

Any future planning for SLR adaptation must begin with an assessment of the community's vulnerability to future effects. The City of Sanibel comprises the entirety of a barrier island. The geomorphology of the island is rather unusual for the southwestern Gulf Coast – Sanibel is an aggradational strand plain (Missimer, 1973; Stapor et al., 1991; Taylor & Stone, 1996), which affords it greater resistance to inundation and erosion because of multiple beach ridges with higher-than-typical elevations. The strand plain sits on the seaward edge of the island, and it is here where suburban development is most pronounced. The leeward side of the island is principally low-lying and composed of a back-barrier mangrove forest. Consequently, the potential effects fore and aft of the island are considerably different.

Vulnerability is also stake holder specific: the community must be both supportive and engaged. The city government and their constituents must be informed and supportive of any planning effort. It is also these same people that understand the value of their landscape and their natural, cultural, and urban resources, and therefore should be involved in the identification and prioritization of Sanibel's assets.

This proposed work is intended as the first steps in a comprehensive vulnerability assessment for Sanibel. We propose two objectives. First, the project will develop and implement a communication plan that both informs residents about the project and the possible effects of accelerated SLR and storms, and, more importantly, engages them in small group forums to address their concerns and to solicit their opinions about critical resources requiring attention. Second, the prediction of coastal response to SLR and storms requires two steps: the landscape, its geomorphology, and its recent history of environmental response (i.e., to the effects of recent storms, extreme tides and wave action) must be described and understood; and then its future response modeled. Because of the time limitation of this funding program, we propose to complete the former – the description and characterization of the coastal landscape and recent history. The latter – the modeling – will occur in the subsequent year. The City and Florida Gulf Coast University (FGCU) are committed to pursuing future funding for these subsequent steps, and are willing to complete much of the future work without compensation, if necessary.

Total Budget Summary: Complete the amounts affiliated with each task and category for your project.

GRANT AGREEMENT TOTAL	**$ 53,460**

Categories	**Task 1**	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**TOTAL BY CATEGORY**
Salary	$6,169.99	$6,169.99	$14,697.70	$11,097.70	$2,878.51	$ 41,014
Fringe	$2,051.10	$2,051.10	$ 3,734.11	$ 3,458.71	$1,150.87	$ 12,446
SUB-TOTAL BY TASK	**$8,221.09**	**$8,221.09**	**$18,431.81**	**$14,556.41**	**$4,029.38**	**$ 53,460**

Total Project Timeline: The tasks must be completed by the corresponding task end date and all deliverables must be received by the designated due date.

Task/ Deliverable No.	**Task or Deliverable Title**	**Task Start Date**	**Task End Date**	**Deliverable Due Date**	**Task Funding Amount**
1	Project Briefings	01/03/19	03/15/19	04/01/19	$8,221.09

2	Forums	02/01/19	03/31/19	04/14/19	$8,221.09
3	Historic Geomorphology	01/03/19	05/31/19	06/14/19	$18,431.81
4	Coastal Vulnerability Mapping	05/01/19	06/30/19	06/30/19	$14,556.41
5	Final Report	06/01/19	06/30/19	06/30/19	$4,029.38

Tasks and Deliverables

Task 1

Title: *Briefings of the Project's Overview and Purpose*

Description: The project will open with 2 presentations / conversations, one for City Government and managerial staff and a second for the public. These gatherings will: introduce the project, provide the necessary background concerning the causes and effects of SLR and increased storminess, gather concerns from participants, and charge attendees with their involvement in Task 2. These meetings will also ask participants to recommend and justify target dates for planning (other regions in SW and SE FL have focused on 2030, 2060, and 2100) and SLR magnitudes (other communities have chosen more conservative NOAA SLR estimates, while cautiously de-emphasizing extreme and highly uncertain magnitudes). Our prior experience has demonstrated that community engagement is fostered by conservative, well-substantiated SLR magnitudes, while downplaying more highly speculative, extremes; this instills optimism while recognizing outcomes could be more severe. Magnitudes and target dates are also best chosen within a context of economic sustainability (i.e., keeping a community economically and socially healthy in light of SLR).

Deliverable: The minutes and decisions generated by these meeting will be made available at the City of Sanibel web site. A special page designed for this project will be generated and serve as the principal communication tool for the community. A copy of the sign-in sheets will be submitted to DEP.

Due Date: 04/01/19

Funding Amount: $ 8,221.09

Performance Measure: The Department will review the deliverable(s) to ensure it meets the specifications provided in the Task Description, above.

Budget for:

Category	**Grant Funds**
Salaries:	$ 6,169.99
Fringe:	$ 2,051.10
TASK TOTAL:	$ **8,221.09**

Salary breakdown: All staff for whom grant funding is being used to pay salary must track the hours spent on each individual task and provide a written statement with the request for payment of the number of hours spent on that task.

Task Number	Position Title	Total hours spent per task	Maximum salary per hour (shall be based on actual salary)	Fringe (either % or fringe per hour)	Total Amount
1	Savarese	96.3	$ 57.84	36%	$ 7,575.19
1	Student	50	$ 12.00	7.65%	$ 645.90

Task 2

Title: *Forums for Resilience Planning*

Description: A series of forums for different groups of stake holders will be scheduled after Task 1 is complete. Three groups will be created, one covering each for natural, cultural, and suburban resources. The project investigators will work with government and civic leaders to develop invitee lists. Venue capacity permitting, the forums will be open to the public. Each forum will ask participants to: (1) voice their general concerns about their resource issues; (2) develop a geospatial inventory of their resource assets, with each asset accompanied by a short description of its value and potential susceptibility; and (3) a prioritization of those assets based on their perceived value. Eventually, these prioritized assets will be mapped on the model-simulated landscapes (generated in the subsequent year).

Deliverable: The asset inventories and descriptions will be compiled and uploaded as ArcGIS geospatial layers. These will then be converted to web page-based story maps for simple viewing and interpretation. Minutes and transcripts from these forums will be posted at the City web site.

Due Date: 04/14/19

Funding Amount: $ 8,221.09

Performance Measure: The Department will review the deliverable(s) to ensure it meets the specifications provided in the Task Description, above.

Budget for:

Category	Grant Funds
Salaries:	$ 6169.99
Fringe:	$ 2051.10
TASK TOTAL:	$ **8221.09**

Salary breakdown: All staff for whom grant funding is being used to pay salary must track the hours spent on each individual task and provide a written statement with the request for payment of the number of hours spent on that task.

Task Number	Position Title	Total hours spent per task	Maximum salary per hour (shall be based on actual salary)	Fringe (either % or fringe per hour)	Total Amount

2	Savarese	96.3	$ 57.84	36%	$ 7,575.19
2	Student	50	$ 12.00	7.65%	$ 645.90

Task 3

Title: *Evaluation of the Historic Geomorphology of the Barrier Island (1970-2018)*

Description: Archived satellite images of the island will be qualitatively analyzed for the spatio-temporal evolution of the Sanibel Island. The images will provide a record of the spatial change in the beach and dune fields, as well as the back-barrier vegetation, over time. These changes will be mapped and the aerial extent of landform and vegetative change evaluated. LiDAR data from 1998 to present and archived FDEP beach profile data will be used to quantify volumetric changes to the beach and dunes. LiDAR data for a number of dates since 1998 will be extracted from NOAA Digital Coast (https://coast.noaa.gov/digitalcoast/), including sets for post-Ivan, Charley, and Irma. From these, digital elevation models (DEMs) will be generated using ArcGIS with a spatial resolution of 1 meter. DEMs will be validated using FDEP archived beach profile data and through RTK-GPS elevation surveys while in the field. Those DEMs will then be used to extract beach profiles. For those dates prior to reliable LiDAR (1970-1997), FDEP archived beach profiles will be employed and combined with the extracted DEM profiles to quantify changes in sediment volume and geomorphologic change along the length of Sanibel's beaches (see Task 4).

Deliverable: The DEMs and beach profiles and corresponding data will be made available. Additionally, web-based maps will be provided showing the geomorphologic and vegetative change.

Due Date: 06/14/19

Funding Amount: $ 18,431.81

Performance Measure: The Department will review the deliverable(s) to ensure it meets the specifications provided in the Task Description, above.

Budget for:

Category	**Grant Funds**
Salaries:	$ 14,697.70
Fringe:	$ 3,734.11
TASK TOTAL:	**$ 18,431.81**

Salary breakdown: All staff for whom grant funding is being used to pay salary must track the hours spent on each individual task and provide a written statement with the request for payment of the number of hours spent on that task.

Task Number	**Position Title**	**Total hours spent per task**	**Maximum salary per hour (shall be based on actual salary)**	**Fringe (either % or fringe per hour)**	**Total Amount**
3	Savarese	25	$ 57.84	36%	$ 1966.56
3	Jose	146	$ 41.45	44%	$ 8714.45
3	Student	600	$ 12.00	7.65%	$ 7750.80

Task 4

Title: *Identify Segments of the Coast Most Vulnerable to SLR and Storm Surge*

Description: The beach profiles extracted from the DEMs, as well as those archived by FDEP, will be further analyzed using SANDS, a modeling software package for developing a sediment budget for the island. Erosional and depositional patterns of the coast will be estimated volumetrically, and this data set will be further analyzed with respect to major hurricane and tropical storm events. Beach profiles, which would extend to the landward limit of the dune fields, will be analyzed to identify sites of previous dune overwash, breaching, and scarping. This analysis will help estimate the stability of the dune fields in the context of storms and SLR.

Deliverable: A coastal vulnerability map will be generated based on both the volumetric analysis and the assessment of dune damage.

Due Date: 06/30/19

Funding Amount: $ 14,556.41

Performance Measure: The Department will review the deliverable(s) to ensure it meets the specifications provided in the Task Description, above.

Budget for:

Category	**Grant Funds**
Salaries:	$ 11,097.70
Fringe:	$ 3,458.71
TASK TOTAL:	**$ 14,556.41**

Salary breakdown: All staff for whom grant funding is being used to pay salary must track the hours spent on each individual task and provide a written statement with the request for payment of the number of hours spent on that task.

Task Number	**Position Title**	**Total hours spent per task**	**Maximum salary per hour (shall be based on actual salary)**	**Fringe (either % or fringe per hour)**	**Total Amount**
4	Savarese	25	$ 57.84	36%	$ 1,966.56
4	Jose	146	$ 41.45	44%	$ 8,714.45
4	Student	300	$ 12.00	7.65%	$ 3,875.40

Task 5

Title: *Final Reporting*

Description: A comprehensive final report will be prepared and submitted.

Deliverable: A comprehensive final report will be prepared and submitted.

Due Date: 06/30/19

Funding Amount: $ 4,029.38

Performance Measure: The Department will review the deliverable(s) to ensure it meets the specifications provided in the Task Description, above. Indirect percentages should not exceed 5%.

Budget for:

Category	Grant Funds
Salaries:	$ 2,878.51
Fringe:	$ 1,150.87
TASK TOTAL:	**$ 4,029.38**

Salary breakdown: All staff for whom grant funding is being used to pay salary must track the hours spent on each individual task and provide a written statement with the request for payment of the number of hours spent on that task.

Task Number	Position Title	Total hours spent per task	Maximum salary per hour (shall be based on actual salary)	Fringe (either % or fringe per hour)	Total Amount
5	Savarese	25	$ 57.84	36%	$ 1,966.56
5	Jose	34.56	$ 41.45	44%	$ 2,062.82