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## Goals, Objectives, and Workplans

With the \$1,544,113 in non CORE funding, SECOORA will enhance Goals 1 – 4. Objectives and tasks are described below and included in Table 1.

### Goal 1: Continue successful operation of the SECOORA governance and management subsystem.

SECOORA will continue working on objectives 1.A – 1.C., as outlined in the SECOORA Core Proposal. With the growth in observing technology, number of Principal Investigators, and affiliated programs, SECOORA will hire a contractor to assist with project/program management. This will help assure that deliverables are achieved.

### Goal 2: Maintain and augment the SECOORA observing subsystem.

Objective 2.A: Maintain existing long-term coastal and ocean observing operations.

#### Additional Mooring Activities:

Grey's Reef OA mooring: SECOORA supports ocean acidification and water quality monitoring at the Grey's Reef National Marine Sanctuary (GRNMS) as part of NOAA's international effort to quantify the effects of ocean acidification. The University of Georgia (UGA, PI Scott Noakes) will maintain and oversee the operation of the mooring sensors at GRNMS and work with NOAA PMEL to ensure data integrity. These sensors include pCO<sub>2</sub>, pH, DO, salinity, chlorophyll, turbidity and water temperature. Sensors are deck mounted on the mooring and mounted under the buoy which require diver support. The entire system including the MAPCO<sub>2</sub>, equilibrator, battery pack, span gas and air block will be replaced once during the year, typically scheduled in early fall. As needed, additional trips (typically 2-3) will be made to the mooring to replace failed or fouled systems. Partners for the OA project include the UGA, NOAA PMEL, NOAA NDBC, and the USCG, which provides vessel support for mooring maintenance.

#### Additional Regional HFR Activities:

HFR funding for retuning: SECOORA is working with HFR operators in the southeast to identify priority funding needs (e.g., personnel, equipment, supplies) related to HFR retuning, testing, and additional work required to comply with the FCC regulations. Funds will be directly administered by SECOORA for equipment, supplies, and travel needs for the HFR operators.

#### Additional Glider Activities:

Support for Glider deployments/recoveries: SECOORA and partners, SkIO, UNCCH, CSI, and USF will coordinate with the U.S IOOS, other RAs, and the U.S. Navy for glider deployments and recoveries as well as glider piloting support during the 2022 Hurricane season. SkIO (PI Catherine Edwards) will lead these efforts and be the main point of contact in the Southeast for both the U.S. IOOS and U.S. Navy glider operators.

#### Additional Observing System Expansion:

Harmful Algal Bloom (HAB) Projects: Via a competitive mini-proposal process, SECOORA will solicit proposals for pilot projects focused on increasing HABS observing and forecasting activities. It is anticipated 1-2 proposals will be funded. An RFP will be published by fall 2022 with the funding decisions made in early winter.

### Goal 3: Implement, integrate, and expand the Data Management Cyberinfrastructure, and Modeling and Analysis subsystems.

### **Additional Data Management Activities:**

Marine Biodiversity Observing Network (ATN/MBON): The overall goal is to support the growing joint MBON and ATN initiatives to integrate acoustic animal tracking data into biodiversity monitoring, and ultimately generate data visualizations of marine biodiversity hotspots. Year 2 activities will be led by the University of Miami (PI Neil Hammerschlag) and will include mapping multi-species hotspots as a metric of biodiversity, mapping and identifying vulnerable and protected hotspots, further integration of data into the [BioTrack](#) project, and sharing of biodiversity maps with SECOORA, MBON, and ATN.

Curation of IOOS open-source repositories and software packages: This project supports the technical implementation of the IOOS DMAC system (PI Filipe Fernandes) including the following activities: assisting in the development of the IOOS.us Documentation and Demonstration sub-pages; monitoring and testing DMAC products and services (CI workflows for specific, canonical datasets - availability/discoverability, metadata, functionalities - plotting etc.); technical research and engagement with external groups (e.g. Pangeo, ESIP); and, IOOS GitHub software library curation and maintenance.

### **Additional Modeling Activities:**

NCDIS Coastal Resilience: The goal of this project is to conduct a 43-year (1979-2021) reanalysis of coastal storm surge with the ADCIRC storm surge and tide model (UNC-CH, PI Brian Blanton). Using the ECMWF ERA5 atmospheric reanalysis, NOAA observed water levels, and a data assimilation system for ADCIRC (Asher et al. 2019), the results will provide detailed datasets of long-term coastal water levels for use in a variety of applications, including flood hazard assessments and as boundary conditions for smaller-scale, regional simulations. Year 2 activities will include:

- *Incorporate tropical cyclones*. Using the IBTrACS database of Atlantic tropical cyclones and the ADCIRC GAHM vortex model, the team will prepare cyclone-specific nested wind/pressure fields and incorporate them into the ERA5 meteorology on a high-resolution (~ 2 km) nested and storm-following grid. The approach will blend the higher-resolution nest into the coarser ERA5 grids. We will test the approach for the year 2018, leveraging the extensive Hurricane Florence hindcast dataset of both winds and water levels that have already been assembled.
- *Recompute the prior, error, and posterior*. Using the cyclone winds computed above, we will recompute the prior, error, and posterior for hurricane seasons in the 43-yr analysis. The software framework for carrying out the sequence of simulations and analyses has been fully tested and will be reused for this and subsequent simulations.
- *Data access and post-processing*. The posterior results will be made available through the RENCIT HREDDDS Data Server (TDS). The team will work with NOAA and affiliates that are hosting the large datasets on cloud resources such as the NOAA Big Data Program infrastructure. We will also develop specific post-processing of the large data files to facilitate easier access. This will be guided by use cases defined by specific end-users such as the Regional Frequency Analysis group.
- *Documentation*. Continue to develop and maintain project documentation suitable for end-users of the datasets. The documentation will contain comparisons of the prior and posterior datasets, with statistics that characterize both the posterior accuracy and the improvements over the prior solution.
- *Great Lakes feasibility*. Collaborating with NOAA GLERL scientists and managers, assess the approach for conducting a reanalysis of the Great Lakes region. This involves identification of existing and suitable ADCIRC grids, access to relevant water level data if not already at NOAA, and ensuring that the expected data products would meet a NOAA/IOOS need.

Integration and evaluation of models to couple with NWM (University of South Florida): The Ocean Circulation Lab of University of South Florida (USF, PI Yongang Liu) maintains a coordinated program of coastal ocean observations and models to describe and understand the circulation of the West Florida Continental Shelf and Tampa Bay, and the role that the circulation plays in shelf ecology and other matters of societal concern. The models include the West Florida Shelf Coastal Ocean Model (WFCOM) that downscale from the deep ocean, across the continental shelf and into the estuaries, and the Tampa Bay Coastal Ocean Model (TBCOM) that is nested in the WFCOM. Both WFCOM and TBCOM are applications of the unstructured grid Finite Volume Community Model (FVCOM). The USF Ocean Circulation Lab will participate in the cross-model software evaluation study to be coordinated by NOAA Unified Forecast System Coastal Application Team.

USF graduate students or postdoc will work as a tester to configure and test FVCOM models for New York Harbor/ Cook Inlet on NSF funded Texas Advanced Computing Center (TACC). The work will include conducting standard test runs for a given region and a given specified computational time/resources to allow fair quantitative model inter-comparison and their performances for a given sub-application. The models will be evaluated independently from other models and then evaluated coupled with either atmospheric or wave models, that will be defined at a later stage. The outcome is providing skill assessment documentation and evaluating the model in the context of operations (stability, code management, ease of operation, etc.)

Integration and evaluation of models to couple with NWM (Brown University): The Brown University team (PI Emanuele Di Lorenzo) will work on the evaluation of the Semi-implicit Cross-scale Hydroscience Integrated System Model (SCHISM) in a modeling testbed for New York Harbor. SCHISM is an open-source community-supported modeling system based on unstructured grids, designed for seamless simulation of 3D baroclinic circulation across creek-lake-river-estuary-shelf-ocean scales. The SCHISM system has been extensively tested against standard ocean/coastal benchmarks and applied to a number of regional seas/bays/estuaries around the world (see [Case study](#)) in the context of general circulation, tsunami and storm-surge inundation, water quality, oil spill, sediment transport, coastal ecology, and wave-current interaction.

The SCHISM model will be configured over the New York Harbor using the unstructured grid with variable resolution (~8 m on average). Using the protocols developed by NOS the team will perform a series of standard test runs for a specified time coverage and assess the skill of the model's ability to reproduce observational benchmarks for following parameters: (1) water levels, (2) surface currents, and (3) density (salinity and water temperature). The simulations will be conducted on the NSF Texas Advanced Computing Center (TACC). The outcome of this project is to provide skill assessment documentation and evaluation of the SCHISM model in the context of operations such as stability, code management, ease of operation, and other protocols established by NOS and the UFS Coastal Applications Team – Water Quantity team.

St. John's River Model Transition: The goal of this project is to develop an integrated coastal water predictive capability to deliver new water intelligence products and information vital for decision making both during high-impact events, such as hurricanes, nor'easters, and storm surge, and for routine water management, including marine ecosystem health and transportation. Fathom Science (PI Ruoying He) is addressing this need by developing a prototype prediction system that couples three-dimensional baroclinic coastal ocean predictions with NOAA's National Water Model (NWM) forecasts and ultimately transition this capability to NOAA's National Ocean Service (NOS).

The focus for this year is on the refinement and testing for the St. Johns River (SJR) modeling system, to include improved model skill performance through a one-year tide simulation and a one-year hindcast simulation using the following operationally available forcing conditions:

- Surface forcing conditions from NWS 4 km nested North American Mesoscale (NAM)-12 atmospheric forecast model data. The NWS Global Forecasting System winds serve as a backup.
- Non-tidal water level open boundary conditions derived either from Extratropical Storm Surge (NWS ETSS) forecasts or from NOAA Global RTOFS.
- Open boundary conditions of non-tidal currents, temperature, and salinity derived from NOAA operational model.
- River forcing conditions from USGS river observations. National Water Model outputs are also a good option for river forcing.

#### **Goal 4: Effectively implement the engagement subsystem to support product co-design and delivery.**

SECOORA partners with other national and regional networks to leverage expertise, expand observing capacity, and provide education opportunities. SECOORA will engage with these groups during Year 2:

- [Regional Ocean Data Sharing \(RODS\)](#) efforts: SECOORA supports efforts aimed at meeting the [nation's Ocean Policy](#) and coordinating discussion to address gaps in regional data. Sea level rise and resiliency are priority issues in our four-state region. State coastal management leads support leveraging the SECOORA Water Level Network (funded through the Core proposal) with the RODS funds. The RODS funds will be used to support state agency and local municipality engagement and assessment at workshops, iterative product design for tools to access water level data, surveying stations, and collaboration with the Sea Grant offices in each state. Sea Grant extension staff already work in coastal communities, allowing their staff to help SECOORA to identify underserved communities in need of water level sensors and the associated water level data.
- [NOAA Southeast and Caribbean Regional Collaboration Team \(SECART\)](#): SECART supports engagement at a regional scale (NC, SC, GA, FL, Puerto Rico, and the U.S. Virgin Islands). SECOORA will support the SECART initiative to bring together NOAA and state agency partners at a meeting to address state agency shellfish monitoring and water quality monitoring concerns within the southeast. The meeting will be hosted in summer 2022 in Beaufort, SC to improve forecasting shellfish closures.
- [Southeast and Caribbean Disaster Resilience Partnership \(SCDRP\)](#) is an affiliation of public, private, and nongovernment organizations (NGO) focused on disaster resilience. SECOORA and SECART will continue to support this community of practice to share resources, catalogue existing activities, host meetings and monthly calls, maintain a website, and submit additional funding requests to ensure sustainability of efforts.
- The [FACT Network](#) is a grassroots collaboration of marine scientists from the Bahamas to the Carolinas using acoustic telemetry to better understand and conserve our region's important fish and sea turtle species. SECOORA provides support for the FACT Animal Telemetry Network (ATN) by hosting their website and sponsorship of the FACT semiannual meetings. Fisheries Data Solutions (FACT data wrangler) leads communications, data acquisition efforts, data quality control, and FACT data visualization tool development.
- [Southeast Ocean and Coastal Acidification Network \(SOCAN\)](#) is dedicated to supporting and encouraging discussions on ocean and coastal acidification. As part of the annual SOCAN workplan, the PIs (Hall and Reimer) will host one stakeholder meeting in 2023. Reports for the

SOCAN meeting will be written and distributed to SOCAN membership, as well as being made available on the [SOCAN website](#). SOCAN will continue its social media presence on Twitter, Facebook, Instagram, the Ocean Acidification Information Exchange, and email updates to members. As part of SOCAN's outreach efforts, PIs will attend and present at one professional conference, which will focus on topics including, but not limited to, information gathered by SOCAN, research conducted through funds granted to SOCAN, and efforts made by SOCAN related to education/outreach. Additionally, SOCAN is partnering with the Gulf of Mexico Coastal Acidification Network (GCAN) to support efforts of the IWGOA Monitoring and Prioritization plan. SOCAN/GCAN will collaboratively write a key findings Executive Summary of research and monitoring gaps identified in the draft IWGOA Vulnerability Assessment Report. The Executive Summary will be distributed to our members/stakeholders (over 150 people) along with a 'report card' style survey. This survey will be designed to rank locations, research and monitoring activities, and identify collaborative opportunities to fill knowledge gaps. SOCAN/GCAN will collaboratively synthesize survey responses and create a report for OAP and the IWGOA to inform future monitoring priorities.

- Vembu Scholar: Annually SECOORA will support a NOAA Hollings Scholar at one of our member institutions.

**Cost Table:**

Funding Area	Amount	PI & Institution	Task
<b>Goal 1: Continue successful operation of the SECOORA governance and management subsystem</b>			
SECOORA	\$35,000	Hernandez, SECOORA	FY22 one-time funds to assist with core needs of the Regional Association.
<b>Goal 2: Maintain and augment the SECOORA observing subsystem</b>			
Ocean Acidification	\$41,915	Noakes, UGA	OAP allotment of FY22 project resources in support of the NOAA Ocean Acidification Observing Network
One Time System Add Ons	\$49,201	Hernandez, SECOORA	HFR system wide support - support for retuning/testing/additional work by SECOORA's HFR Operators to Comply with FCC Regulations.
SECOORA	\$30,000	Edwards, UGA SkIO	Glider (system wide support) funding from the OMAO to support 2022 Navy glider deployments and recoveries
One Time System Add Ons	\$10,000	Edwards, UGA SkIO	Gliders: to support glider deployments and recoveries
Harmful Algal Blooms (HABs)	\$150,000	Hernandez, SECOORA	To further HABS understanding and prediction
<b>Goal 3: Implement, integrate, and expand the DMAC and Modeling and Analysis subsystems</b>			
Marine Biodiversity Observations Network	\$75,000	Hammerschlag, UM	MBON-ATN acoustic telemetry data project
Filipe Fernandes	\$90,000	Fernandes, Independent Contractor	Curation of IOOS open-source repositories and software packages through ongoing development of the IOOS data discovery, access tools, and demonstrations as part of the IOOS.us, and ioos.github.io web pages.
University of North Carolina - Chapel Hill	\$357,500	Blanton, UNC-CH and RENCi	NCDIS Coastal Resilience: support for coastal inundation work (modeling reanalysis)
SECOORA	\$99,644	Liu, USF	Funds to support the integration and evaluation of models to couple with NWM
SECOORA	\$97,500	Di Lorenzo, Brown University	Funds to support the integration and evaluation of models to couple with NWM
SECOORA	\$150,000	He, Fathom Science	Funds to support the Project: St. John's River Transition
Funding Area	Amount	PI & Institution	Task



<b>Goal 4: Effectively implement the engagement subsystem to support product co-design and delivery</b>			
Regional Ocean Data Sharing	244,400	Hernandez, SECOORA	Regional Ocean Data Sharing Initiative
SECOORA	\$4,800	Hovis, SCDRP & Hernandez, SECOORA	NOAA's Southeast and Caribbean Regional Team supports the Southeast and Caribbean Disaster Resilience Partnership (SCDRP) Coordinator position (\$3,800) and supports SECOORA to bring together NOAA and partner resources with state shellfish managers to improve forecasting of shellfish closures (\$1,000)
SECOORA	\$69,153	Young, FACT Network	Data Wrangler position for the FACT Acoustic Telemetry Network
Ocean Acidification	\$35,000	Hall, Mote Marine Laboratory & Reimer, Independent Contractor	OAP allotment of FY22 project resources in support of the Southeast Ocean and Coastal Acidification Network
SECOORA	\$5,000	Hernandez, SECOORA	Vembu Scholarship
<b>Total Non CORE Funding</b>	<b>\$1,544,113</b>		

**References:**

Asher, T., Luettich Jr, R., Fleming, J., and Blanton, B. (2019). Low frequency water level correction in storm surge models using data assimilation. *Ocean Modelling*, 144:101483.