Southeast Coastal Ocean Observing Regional Association (SECOORA): Delivering actionable coastal and ocean information from high-quality science and observations for the Southeast

Revised Scope of Work - Year 3 Core IOOS Funding

TOPIC AREA 1: Implementation and Development of Regional Coastal Ocean Observing Systems
AWARD TYPE: Cooperative Agreement
PROJECT DURATION: July 1, 2021 – June 30, 2026

This revised grant proposal is submitted in response to the Funding Opportunity Title:
Implementation of the U.S. Integrated Ocean Observing System (IOOS)
Submitted: March 2, 2023
Year 3: July 1, 2023 – June 30, 2024
Funding Request: $3,061,136

Principal Investigator:
Debra Hernandez, Executive Director
SECOORA
PO Box 13856
Charleston, SC 29422
P: 843-906-8686
E: debra@secoora.org

Associate Investigator:
Megan Lee, Business Manager
SECOORA
PO Box 13856
Charleston, SC 29422
P: 843-864-6755
E: mlee@secoora.org

Associate Investigator:
Jennifer Dorton, Deputy Director
SECOORA
PO Box 13856
Charleston, SC 29422
P: 910-443-178
E: jdorton@secoora.org

Associate Investigator:
Gary Mitchum, SECOORA Board Chair
Professor and Associate Dean
USF College of Marine Science
140 7th Ave. South
St. Petersburg, FL 33701
P: 727-553-3941
E: mitchum@usf.edu

Table of Contents

Goals, Objectives, and Workplans

With the $3,061,136 funding award, SECOORA will implement Goals 1 through 4 (as identified in our original proposal) to support SECOORA's base capacity and enhance the RCOOS. Objectives and tasks are described below and included in Table 1, Milestones.

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

Objective 1.A: Maintain the SECOORA governance and operational structure through implementation of SECOORA's Bylaws and Strategic Plan.

SECOORA's Strategic Plan was updated for the 2021-2023 period. SECOORA will undertake a Strategic Plan refresh in 2023 with the goal of a revised plan to cover the period 2024-2028. The revised Strategic Plan will still have a focus on our commitment to a diverse, equitable, and inclusive organization which will further enhance our role in the region as a coordinating entity. SECOORA will continue to foster internship opportunities with HBCUs and MSIs to promote diversity and workforce training initiatives undertaken by our members and partners. SECOORA is also working with the IOOS Association, other IOOS regions, and the IOOS Program Office to diversify workforces and improve our ability to provide relevant ocean and coastal data and information to underserved or underrepresented communities. Progress is shared with the Board and members during annual meetings. The Year 3 Board meeting will be held in December 2023 and the Board and Members meeting held in May 2024 (locations and dates TBD).

Objective 1.B: Maintain SECOORA's certification as a Regional Association.

SECOORA is certified by NOAA as a RCOS. SECOORA prioritizes, gathers, manages, and distributes observation data for the SE, and has the data management architecture, policies, and procedures to support these activities. SECOORA's certification renewal was approved November 8, 2022. SECOORA will maintain certification throughout Years 3-5. SECOORA's Certification web page is the up-to-date source for certification documents: https://secoora.org/certification. The site has extensive details on our operations and policies, and it is maintained and updated annually, as needed.

Objective 1.C: Annually update SECOORA's 2020-2025 RCOOS Plan

Implementation of the RCOOS Plan occurs through the four subsystems: observing, DMAC, modeling and analysis, and engagement. Details of this implementation throughout the five-year period of this proposal are described in Goals 2 – 4. The SECOORA Deputy Director leads management of the RCOOS through execution of subawards with our partners and supports SECOORA's Science Committee which reviews annual updates to the Plan. Since the initial RCOOS Plan development, SECOORA has approved addendums to the original plan. These addendums are issue/technology specific and provide a more detailed analysis of regional needs and investments than can be covered in the RCOOS Plan. These finalized addendums include a Modeling Framework (2023), Harmful Algal Bloom Plan (2022), and the HFR Plan, Version 2 (2022). During Year 3, SECOORA will revise the HAB plan to include recently funded HAB research in Georgia and Florida as well as edits that are requested by the Science Committee. The overall SECOORA RCOOS plan will be revised in 2024 and will cover the period 2025-2030.

Goal 2: Maintain and augment the SECOORA observing subsystem.

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

Moorings: SECOORA real-time and non-real-time moorings are operated by the University of North Carolina Wilmington (UNCW) and the University of South Florida (USF). UNCW operates 12 real-time moorings and 1 non-real-time mooring along the coasts of NC and SC. USF uses SECOORA funding to fully operate 2 real-time moorings and 2 non-real-time moorings and partially funds the operation of two additional real-time moorings (C13 and C22). USF moorings are located on the West Florida Shelf. UNCW

and USF also support the FACT Animal Telemetry Network (ATN) by deploying acoustic receivers attached to existing moorings (4 on UNCW moorings, 2 on USF moorings) to record tagged fish passage near the receivers. The receivers are recovered twice each year during mooring turnaround cruises, downloaded, and the data shared with the FACT ATN node.

All real-time moorings/instrumentation have a targeted up-time of 85%. Metrics for the real-time buoys are reported in the SECOORA 6-month progress reports. All UNCW and USF real-time data is made available to SECOORA and NDBC. QARTOD required and recommended tests are conducted for all real-time data and roll-up pass/suspect/fail flags are provided with the data. Non-real-time moorings are serviced 2 times per year; data from these stations are downloaded from the sensors, quality controlled, and shared for archival with SECOORA and NOAA's NCEI.

High Frequency Radar (HFR): SECOORA operates 18 HFR with 2 HFR installations to be completed for a total of 20 HFR.
- UNC-Chapel Hill (UNCCH) and East Carolina University's Coastal Studies Institute (CSI) operate four CODAR HFR on the North Carolina Outer Banks
- USF operates three CODAR on the west coast of Florida.
- The University of South Carolina (UofSC) operates three WERA in North Carolina and South Carolina
- UGA Skidaway Institute of Oceanography (SkIO) operates two WERA in Georgia and one WERA in Florida. The fourth installation is currently delayed due to beach erosion at Kennedy Space Center. Installation is TBD.
- Florida Institute of Technology (FIT) operates one WERA at Treasure Shores Park, FL. One WERA installation is TBD at Hightower Park, FL. FIT is waiting on the approval to install from the City of Satellite Beach as the City has to update the park operations plan before the site can be installed.
- The University of Miami (UM) operates four WERA HFR in the Miami and Florida Keys area.

SECOORA HFR operators will provide surface current data in near real-time with a targeted up-time of 85%. Hourly data is provided to SECOORA and to the HFR National Network. Operational and quality metrics are routinely checked. These include assessment of daily variations in coverage and uptime using metrics such as database latency, range of coverage, and number of solutions as implemented by the National HFR Network. UofSC, SkIO, FIT, UM, UNCCH, USF, and CSI have all received FCC operational licenses for their systems. All HFR operators maintain a list of recapitalization costs required for continued HFR operations and the information was provided with the January 2023 Year 2 progress report. The progress reports provide details on HFR status, operators, location, and operating frequencies.

Glider Operations: The SECOORA glider team includes SkIO, USF, UNCCH, and Georgia Tech. The team will conduct four (4) regional glider missions to capture regional 4-D information about temperature, salinity, and density structure, oxygen/turbidity/CDOM/chl-a concentrations for use to investigate hydrography and circulation dynamics in the region, including connectivity between the Loop Current, Florida Current, Gulf Stream. Each glider mission is 20-30 days in duration. The team will continue to integrate smart piloting strategies using GENIoS to optimize navigation based on real time data streams from operational ocean models, HFR, and other gliders. The glider team follows data collection and data sharing methods identified in the U.S. Underwater Glider Workshop Report. Mission data are disseminated to the international scientific community via the National Glider Data Assembly Center (DAC) where they are made available to the oceanographic modeling community.

Biological Data Collection: The Estuarine Soundscape Observatory Network in the Southeast (ESONS) is led by the University of South Carolina Beaufort (USCB). The ESONS observatory consists of 9 existing

passive acoustic sensors deployed in South Carolina: 3 in the May River, 1 in Chechessee Creek, 1 in Colleton River, 3 in Charleston Harbor, and 1 North Inlet Winyah Bay NERR. Each station includes a passive acoustic recorder, water level loggers, and a temperature logger, all used to monitor animal behavior at multiple levels of biological complexity (from snapping shrimp to fish to marine mammals) and time scales. The project team conducts annual soundscape analysis to identify species, range, and seasonality for the May River, Chechessee Creek, Colleton River, Charleston Harbor, and North Inlet Winyah Bay. The collected wav files are shared with SECOORA for storage and visualization on the soundscape webpage. The webpage is updated annually to include new soundscape endpoints for each species and to expand the number of species available on the page. Additionally, the team is exploring lessons learned related to metadata format, file sharing, and website design from the SanctSound project to incorporate into this effort.

Objective 2.B: Expand the observing subsystem to address the region's highest priority needs as identified in the SECOORA RCOOS Plan.

Water Level Network (WLN): SECOORA established a real-time, regional water level network in Year 1 to address needs for community flooding information. Year 3 WLN team members include representatives from the American Shore and Beach Preservation Association (ASBPA)/Hohonu, and Georgia Tech. Year 3 activities for ASBPA/Hohonu include maintenance of sensors deployed in Years 1-2, development of operation and maintenance procedures, and comparison of survey methods. Georgia Tech plans to maintain stations installed in Years 1-2 and install 8 new water level stations in Year 3. Note that planned sensor deployment documentation has already been shared with the Environmental Compliance Manager via a Google Drive spreadsheet. The team has drafted Standard Operating Procedures (SOPs) for 1) site reconnaissance; 2) sensor installation, maintenance, and removal; and 3) vertical elevation surveys. The team will finalize these SOPs and make them available on the SECOORA website. These draft SOPs also have been shared with NERACOOS as they explore water level station installation. The water level advisory committee, convened in Year 1 and comprised of NOAA, state, and regional governments, and Sea Grant representatives, will continue to provide oversite for this project.

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

The DMAC subsystem is an integrating and foundational subsystem of the RCOOS, that when coupled with the observing and modeling and analysis subsystems, enables the transformation of raw data into accessible and credible information for decision-makers. SECOORA works with its DMAC contractor, Axiom Data Science, to provide data management support, data systems architecture, software engineering, and cyberinfrastructure operational services to meet the US IOOS DMAC data standards and requirements. Axiom works with SECOORA and our partners to support a regional data assembly center, operate and continuously improved its functionality, and provide a regional web-based data portal (https://portal.secoora.org/) for access to ocean and coastal environmental data and information products across the US SE.

Objective 3.A: Maintain and enhance the DMAC subsystem.

Core DMAC subsystem: SECOORA will continue to operate and improve the core DMAC subsystem. More information on SECOORA data standards and requirements and adherence to the NOAA Environmental Data Management Framework can be found in the SECOORA Data Management and Cyberinfrastructure Plan, which includes the Data Sharing Policy and Methods to Address IOOS Core Capabilities.

Core components of the SECOORA DMAC subsystem include the following:
- High Performance Computing (HPC)
- Data Assembly and Quality
- Implementation of Community Standards and Systems
- Modern Big Data Analysis and Machine Learning
- Data Product Support
- Integration with Other National Cyberinfrastructure
- Human Expertise and Capacity
- Provide real-time buoy data from SECOORA funded buoy operators (UNCW, USF) to NOAA NDBC via ERDDAP server
- Annual data archival for physical oceanographic, biogeochemical, and meteorological data with NOAA's NCEI
- Product Usage Statistics – SECOORA uses Google Analytics to track usage statistics for the data portal, webpage, and products.

Additional details on these subcomponents can be found in the SECOORA DMAC Plan, found here: https://secoora.org/certification/ - section III. Data Management and Cyberinfrastructure.

Objective 3.B: Maintain and enhance the Modeling and Analysis subsystem
3.B1. Modeling: Provide forecasts for select coastal ocean phenomena
CNAPS Model: SECOORA project team members at NCSU and Fathom Science will maintain and continue developing CNAPS to provide near-real time nowcasts/forecasts for regional-scale marine environment conditions. During Year 2, the team completed a 30-year 4km resolution, 50 vertical layer CNAPS-2 reanalysis product and experimented with various cloud computing solutions for hosting model output. The team is working with SECOORA and Axiom Data Science to assist with the distribution of the CNAPS modeling results. This year, the team will complete transitioning the CNAPS-1 system nowcasts and forecasts to a cloud computing environment. With the 30-year reanalysis product, the team will generate regional ocean circulation climatology (long-term baseline information) from which quantitative assessments of climate change impacts and its variability in the southern US marine hydrodynamics can be made.

WFS Models: SECOORA partner, USF, will maintain the West Florida Shelf and Tampa Bay (WFCOM and TBCOM) daily nowcasts/forecasts of currents, temperature and salinity, and surface height fields with a targeted up-time of 90%. WFCOM downscales from the deep ocean, across the continental shelf and into the major estuaries by nesting the unstructured grid FVCOM in the GOM HYCOM, affording increasingly finer resolution upon approaching the coast. TBCOM achieves 20-m resolution by nesting FVCOM in WFCOM. TBCOM includes Tampa Bay, Sarasota Bay, the Intra-Coastal Waterway and all of the inlets connecting these with the GOM. The latest version of WFCOM includes the west FL Intra-coastal Waterway and inlets, a realistic representation of the FL Keys and inlets extending north to Biscayne Bay. Both WFCOM and TBCOM provide daily, 4.5-day (1 day hindcast, 3.5 day forecast) trajectories to assist with red tide tracking, search and rescue operations, other environmental concerns (e.g., oil spills), and glider path planning. Model output is available via NOAA GOODS and the COMPS THREDDS server.

3.B2. Integrate improvements in the analysis components of the modeling and analysis subsystem to speed transformation of data into information required by users.
AI Portal: Florida Wildlife Research Institute (FWRI) and Axiom are building an artificial intelligence annotation data portal (AI portal). Year 3 activities build upon Year 1 and 2 accomplishments. In Year 3 the

team plans to publish information on data standards related to AI applications; metadata; formatting requirements for imagery, video, and acoustic data; and, storage and access solutions for common AI workflows. The information will be published in an accessible, interactive web format that highlights the AI Portal as a gateway repository for AI standards and resources. Additionally, in Years 1 and 2 the team conducted workshops and outreach activities to understand the AI landscape and technical requirements for the new AI portal. In Year 3, a beta version of the portal will be developed based on this input and it will be tested by end-users. The team will also build a back-end environment for AI portal users to push their imagery (benthic, spectrograms, or other images) into existing repositories, such as NCEI, coralnet, or fathomnet, while demonstrating example imagery workflows.

Southeast Area Monitoring and Assessment Program, South Atlantic (SEAMAP-SA): SC Department of Natural Resources (SCDNR) and Axiom will continue to improve and expand biological data analysis tools including providing updated data of all types for core SEAMAP-SA surveys (reef fish, coastal trawl, Pamlico Sound and coastal longline) as they become available. Axiom will continue to update the Adminstration interface to allow SEAMAP-SA to directly append or update data and code tables. SEAMAP-SA staff will test summarization tools to access accuracy and develop training videos for data access, summarization, and visualization tools. The team will also test using SECOORA environmental data, i.e. temperature or salinity, in index development for species on assessment schedules.

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

A central goal of SECOORA is to develop, in partnership with end users, operational products that will support decision-making. Along with ongoing delivery of the regional model forecasts that fill temporal and spatial gaps in observations, SECOORA will develop and enhance products in collaboration with our partners to support their operational needs.

Objective 4.A. Engage with stakeholders to identify and respond to their needs
4.A1. Support community-driven networks focused on priority societal issues aligned with SECOORA's mission and Strategic Plan.

SECOORA partners with other national and regional networks to leverage expertise and expand observing capacity. SECOORA will remain engaged with these groups during Year 3:

- IOOS Association is a national nonprofit organization established to advance U.S. IOOS and the nation's coastal observation information needs by working with the 11 Regional Associations, US IOOS, NOAA federal agencies, and other partners
- SECOORA will continue to manage funding, partner on proposals, and provide personnel support for the FACT Network, Southeast Ocean and Coastal Acidification Network (SOCAN), and the Southeast and Caribbean Disaster Resilience Partnership (SCDRP).
- The Water Level Advisory Committee is engaged with the Water Level Network and will provide guidance and feedback for the team related to senor locations, station metrics, data sharing, etc. (Objective 2B).

4.A2. Maintain and enhance the SECOORA outreach and engagement subsystem to address priority issues in the region

The SECOORA Communications Director will continue the Coastal Ocean Observing in Your Community webinar series, website updates with news stories and extreme event pages such as the Florida Red Tide Resources Page and the Hurricane Resources Page, quarterly newsletters, social media posts, and hosting and participating in workshops and meetings.

4.A3. Engage students in problem solving using ocean observing data

The SECOORA Education and Outreach Committee, under the leadership of the Communications Director, provides guidance on prioritizing education and outreach needs. Annually SECOORA will host two student awards: the Data Challenge and Vembu Subramanian Ocean Scholars Award. SECOORA will continue providing opportunities for formal and informal educators to develop online coastal and ocean related curriculum. Additionally, SECOORA staff and PIs actively support education activities through data workshops, participation in the St. Pete Science Festival, and hosting field trips to coastal monitoring stations throughout the region.

Objective 4.B: Product Development

SECOORA will work with stakeholders to identify product needs and evaluate existing products to determine ongoing limitations and demands as well as potential for expanding either geographic coverage or product offerings. All proposed products fit within the identified SECOORA focus areas and provide environmental and/or economic benefit to our stakeholders. Current products include Text a Buoy, Estuarine Soundscape Observatory Network, the Marine Weather Portal (MWP), the Hurricane Portal and How's the Beach. We anticipate future products will address water level data, acoustic data (i.e., soundscapes or summary habitat use and seasonality from fish tags), and HFR.

SECOORA will invest in the follow product development efforts:

How's the Beach Expansion: Support the enhancement of How's the Beach nowcasts (UofSC), and the integration of How's the Beach, ShellCast (NCSU), and Beach Condition Reporting System (BCRS, Mote Marine Lab). The project team will: 1) A. work with EPA partners to assess the Virtual Beach modeling toolset, and B. host a host a modeling workshop for beach managers and regulators to advance the community of practice around modeling techniques and evaluation; 2) continue to develop documentation on web development and data sharing related to the integration of How's the Beach with BCRS and How's the Beach with Shellcast; 3) A. develop initial models for expansion of ShellCast forecasting into selected shellfish harvesting waters of FL, and B. develop initial models for expansion of How's the Beach nowcasting to swimming beaches of Tybee Island, GA.

Situational Awareness Support-tool for weather forecasters and ocean rescue groups: Using data from UNCW's NC and SC buoys, this module leverages the SECOORA DMAC subsystem to allow weather forecasters and ocean rescue groups to register, administer, and view custom thresholds for any combination of in situ parameters. Users are able to save their selected thresholds and receive texts or emails when the threshold criteria are met or exceed (e.g., waves are above 2 ft, winds are above 15 knots). During Years 1-2, the test group for the tool was limited to the Newport/Morehead City, Wilmington, and Charleston NWS offices. During Year 3, the team will add additional super-users to the test group (e.g., NOAA NWS staff in Melbourne, FL, SECOORA staff, Power Squadron members, Beach Rescue organizations). Feedback will be used to refine the tool and the team will begin the transition from a development/beta product to an operational product.

Water Level Network User Interface: SECOORA is leveraging previously funded AOOS and Axiom work on the Alaska community water level initiative to establish the data services and back-end data management for the water level data provided by the SECOORA Water Level Network. A public facing site is under development (wl.secoora.org) and will pull data from the Axiom data management system. The website development team is quality controlling the raw water level data to QARTOD standards; however, NAVD88 elevations for all the stations are not currently available. Once the vertical elevation surveys are

complete for the water level stations, data can be processed to a datum and made available on the website.

Summary

The proposed $3,061,136 in funding will support the continued operation of the core RCOOS framework. As a mature RA, SECOORA must balance maintenance, filling important gaps in observations, and creating new connections to users through thoughtful expansion of products and services to build-out the RCOOS. The proposed activities will deliver stakeholders the ongoing observations and modeling products they rely on, and new integrative project components that leverage existing SECOORA efforts (observations, models, and DMAC) to create new and exciting opportunities.

Milestones and Cost Proposal

Table 1. Goals, Objectives/Milestones and Schedule

Milestones	Q1	Q2	Q3	Q4
Goal 1: Continue successful operation of the SECOORA governance and management subsystem				
Maintain the SECOORA governance and operational structure	X	X	X	X
Maintain SECOORA's certification as a RCOS	X	X	X	X
Update the SECOORA RCOOS Plan	X	X	X	X
Goal 2: Maintain and augment the SECOORA observing subsystem				
Operate and maintain 16 existing real-time moorings offshore of NC, SC, and FL	X	X	X	X
Operate and maintain 3 non-real time moorings offshore of NC and FL	X	X	X	X
Operate and maintain 20 HFRs regionwide	X	X	X	X
Conduct 4 glider missions	X	X	X	X
Maintain the SC estuarine soundscape observatory using passive acoustic recorders	X	X	X	X
Site, deploy, and maintain water level sensors	X	X	X	X
Goal 3: Implement, integrate, and expand the DMAC and Modeling and Analysis subsystems				
Maintain and enhance the SECOORA DMAC subsystem	X	X	X	X
Maintain the CNAPS model, move system to Cloud, make 30-year reanalysis products	X	X	X	X
Maintain the WFS models (WFCOM and TBCOM)	X	X	X	X
Construct an interactive AI annotation data portal	X	X	X	X
Develop biological data analysis tools through integrations of SEAMAP-SA fish survey data	X	X	X	X
Goal 4: Effectively implement the Engagement subsystem to support product co-design and delivery				
Maintain and enhance the SECOORA outreach and engagement subsystem	X	X	X	X
Engage students through SECOORA scholarship and funding opportunities	X	X	X	X
Enhance How's the Beach to include products for shellfish & recreational swimming water advisories	X	X	X	X
Develop a situational awareness tool for weather forecasters and ocean rescue	X	X	X	X
Continue developing the online water level interface	X	X	X	X

Cost Proposal. Summarized costs of this 2023-2024 effort are in Table 2. $3,061,136 support Goals 1 through 4.

Table 2. Costs by Objective, PI and Institution

Obj.	PI/Contractor	Inst.	YR 3
Goal 1	**Governance & Outreach**		
1.A – 1.C	Hernandez (Governance & Outreach)	SECOORA	$655,153
	Goal 1 Sub-total		**$655,153**
Goal 2	**Maintain and augment the SECOORA observing subsystem**		
2.A – 2.B	**Moorings**		
	Leonard (NC and SC)	UNCW	$329,362
	Liu (FL)	USF	$300,000
	Hernandez (R/V Savannah ship time)	SECOORA	$41,924
	High Frequency Radar		
	Seim (CORE)	UNC-CH	$56,020
	Muglia (DUCK, HATY, OCRA)	ECU CSI	$67,780
	Merz (VENI, RDSR, NAPL)	USF	$110,000
	Voulgaris (CSW, MBSP, GTN)	UofSC	$110,000
	Savidge/Edwards (CAT, JEK, CNS, TBD KSC)	UGA SkIO	$110,000
	Lazarus (TSP, TBD Hightower)		$91,000
	Shay (CDN, VIR, STF, NKL)	UM	$123,800
	Gliders		
	Edwards	UGA SkIO	$66,000
	Lembke	USF, UNC-CH, GT	$61,000
	Seim	UNC-CH	$41,000
	TBD PI (waiting on change of PI documentation)	GT	$32,000
	Biological Data Collection		
	Montie - ESONS (SC)	USC-B	$100,000
	Water Level Stations		
	Elko and Glazer (NC, SC, FL)	ASBPA & Hohonu	$74,998
	Clark (GA)	GT	$75,000
	Goal 2 Sub-total		**$1,789,884**
Goal 3	**Implement, integrate, and expand the DMAC and Modeling and Analysis subsystems**		
3.A	Maintain and Enhance the DMAC subsystem		
	Core DMAC support	Axiom	$199,600
3.B	Maintain and enhance the Modeling and Analysis subsystem		
	He - CNAPS model	NCSU & Fathom Science	$149,983
	Liu – WFS models	USF	Included in Moorings budget line
	McEachron – AI annotation portal	FWRI	$88,000
	Smart - SEAMAP	SC DNR	$28,856
	Goal 3 Sub-total		**$466,439**
Goal 4	**Effectively implement the engagement subsystem to support product co-design and delivery**		
4.A1	Support community-driven networks focused on priority societal issues aligned with SECOORA's mission and Strategic Plan.		
4.A2	Maintain and enhance the SECOORA outreach and engagement subsystem to address priority issues in the region – Costs included in Goal 1: SECOORA Governance and Outreach		
4.A3	Engage students in problem solving using ocean observing data		
4.B	Product Development		
	Porter (How's the Beach Expansion)	UofSC	$149,660
	Situational Awareness Support-tool	UNCW	Included in Moorings budget line
	Goal 4 Sub-total		**$149,660**
	GRAND TOTAL		**$3,061,136**