NGI
NORTHERN GULF INSTITUTE
a NOAA cooperative institute

Fall 2017

The
Portal
Official Newsletter of the Northern Gulf Institute

IN THIS ISSUE

www.NorthernGulfInstitute.org

NGI General Description and Core Activities

The Northern Gulf Institute (NGI) is a National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute, a partnership of six complementary academic institutions and NOAA addressing important national strategic research and education goals. Mississippi State University leads this collaboration, partnering with the University of Southern Mississippi, Louisiana State University, Florida State University, Alabama's Dauphin Island Sea Lab, the University of Alabama in Huntsville, and NOAA scientists at various laboratories and operational centers in the Gulf of Mexico region.

NGI develops, operates, and maintains an increasingly integrated research and transition program, the results of which raise awareness and understanding of the Gulf region. NGI was recognized by the NOAA Cooperative Institute Science Review Panel in October 2009 for its significant efforts to address important questions related to the NOAA Strategic Goals. NGI has been recognized as critical and well positioned to provide baseline, current, and future science and outreach needs to the region. The necessity of such a role for NGI is acutely demonstrated by Gulf of Mexico catastrophes like Hurricane Katrina and the Deepwater Horizon incident.

The Institute contributes to NOAA's priority interests in the four NGI research themes of Climate Change and Climate Variability Effects on Regional Ecosystems, Coastal Hazards, Ecosystem Management, and Effective and Efficient Data Management Systems Supporting a Data-driven Economy. Important recent research accomplishments by NGI researchers, in collaboration with multiple NOAA researchers, focus on the issues and resources of the Gulf with many of the tools and protocols transferrable to other coastal environments. Additional details are available in the second section on Project Reporting.

The NGI Education and Outreach Program provides an integrated comprehensive approach to educate the public on NGI priority issues associated with NGI research and to facilitate the transition of NGI research to NOAA operational centers. The program connects universities to NOAA and works closely with the educational programs at the Gulf of Mexico Alliance, the various Gulf of Mexico Sea Grant programs and the NOAA Gulf of Mexico Regional Collaboration Team. Together we develop communication and significant long term messaging campaigns to address identified priority issues.

All Hazards
NOAA
Weather Radio
NOAA's National Weather Service

As part outreach and part research planning, NGI participated in or hosted a variety of workshops during this reporting period. The NGI Education and Outreach Program disseminates content and reports of research accomplishments through a multi-media approach including listserv emails, Twitter, Facebook, and continual updates to the institution's website with NGI audience relevant news. Content includes recent information about research activities and transitioned results, essential components of the collaboration, operation updates, and other outreach items of interest
(see: www.NorthernGulfInstitute.org).

The NGI Education and Outreach Program strives to enhance NOAA workforce development by including students in several aspects of the cooperative institute. They are involved in research project performance and reporting, internships, career fairs, NGI associated volunteer opportunities, and network support.
NGI Management, Mission, and Vision
The NGI leadership team adopted a ten year NGI Strategic Plan on June 24, 2011 (http://www.northerngulfinstitute.org/about/documents.php). With input from its university and NOAA partners, the NGI Program Office strives to make the complex collaborations as efficient and easy as possible for the participants with regular teleconferences and meetings.

Mission and vision statements
NGI Mission: NGI conducts high-impact research and education programs in the Northern Gulf of Mexico region focused on integration – integration of the land-coast-ocean-atmosphere continuum; integration of research to operations; and integration of individual organizational strengths into a holistic program. The program shall measurably contribute to the recovery and future health, safety, resilience and productivity of the region, through sustained research and applications in a geospatial and ecosystem context.

NGI Vision
NGI will be a regional leader providing integrative research and education to improve the resiliency and conservation of the Northern Gulf of Mexico.

NGI Research and Focus
The NGI Science, Education and Research Management Plan and the NGI Strategic Plan describe how the Institute develops a program of scientific inquiry that supports the needs of the National Oceanographic and Atmospheric Administration (NOAA) line offices. Research primarily addresses goals of NGI, NOAA, and the Gulf of Mexico Alliance and secondarily other programs that align with those programs.

Ecosystem Management
Research in this theme will focus on promoting sustainable coastal development, facilitating community resiliency and enabling an ecosystem approach to management, including ecosystem-based fisheries management. These foci are based upon enhanced scientific understanding of the interconnections between the marine ecosystem and the adjacent watershed including their resource stewardship implications.

Effective and Efficient Data Management Systems Supporting a Data-driven Economy
Research in this theme will investigate, develop and test innovative data stewardship solutions, enhancing NOAA's data management, visualization, and dissemination capabilities. This research will address gaps in data management capacity resulting from the development of new environmental data sensors and platforms, larger data volumes, and increased public demand for information.

Climate Change and Climate Variability Effects on Regional Ecosystems
Research conducted under this theme will focus on climate change and climate variability effects upon marine ecosystems and the socioeconomic well-being of the region and the adjacent watershed as well as ecosystem effects upon climate processes.

Coastal Hazards:
Research in this theme encompasses the physical and biological systems, as well as the biological and socio-economic dimensions, associated with coastal hazards. economically critical ecosystems in the Nation. Coastal hazards and public health and safety are major concerns to agencies responsible for the public good of coastal regions. Weather and ocean phenomena considered in the context of anthropogenic factors pose considerable resource sustainability, financial and safety threats to the Gulf coast region

Photo Credit:

Image ID: wea04330, NOAA's National Weather Service Photographer: Lieutenant Commander Matthew Wingate

Executive Summary of Important Research Activities

Many of the research projects are providing new and improved tools and capabilities in support of NOAA's Weather - Ready Nation goal as briefly summarized below.

Analysis by FSU researchers of the stepped-frequency microwave radiometers (SFMR) wind-induced emissivity measurements collocated with dropsondes identified two distinct wind speed regimes for which the distribution was statistically different. It was found that the 10 to 20 m/s SFMR wind-induced emissivity measurements had a low bias compared to the modeled wind-induced emissivity, but no apparent storm relative azimuthal asymmetry. For the 20 m/s or greater SFMR wind-induced emissivity measurements, there was a storm relative azimuthal asymmetry identified.

Research continues to produce fields of surface turbulent air-sea fluxes and the flux related variables (winds, SST, near surface air temperature, near surface humidity, and surface pressure) for use in global climate studies. The FSU winds (monthly averages of gridded winds over the tropical oceans) were produced and made available to a wide range of users such as ENSO and fisheries forecasters.

The NOAA Office of Dissemination is evaluating the use and applications of NOAA Weather Radio All Hazards to determine user requirements to transform the current NOAA Weather Radio All Hazards broadcast network into a new integrated weather information distribution/dissemination system. The project team at the University of Alabama are currently conducting case studies of actual events to study modalities.

Analyses of profiler and radar data continued to document the variability in low-level clouds, thermodynamics, and wind (wind shear) for cold-season tornado events. Ceilometer data were examined to determine cloud base height distributions and cloud cover fraction around tornadic storms (supercell vs. QLCS) to address the hypothesis that cloud fraction (cloud base height) tends to be high (low) for tornadoes in the Southeast.

Activities of the U.S. Research Vessel Surface Meteorology Data Assembly Center (DAC) at the Florida State University (FSU) included continued implementation of the Shipboard Automated Meteorological and Oceanographic System (SAMOS) initiative (http://samos.coaps.fsu.edu/). The SAMOS initiative is focused on improving the quality of and access to surface marine meteorological and oceanographic data collected in situ by automated instrumentation on research vessels. During the reporting period (10/1/16-6/30/17), 28 research vessels routinely transmitted daily emails containing one-minute averaged meteorology and surface oceanographic data to the DAC. This project ensures that the highest quality marine meteorological and near surface oceanographic data are collected by research vessels, primarily from the U.S. fleet, and that they are distributed and archived in a manner that makes the data accessible and useful to a diverse research and operational user community.

Additional assessment of data from the National Buoy Data Center (NDBC) provided validation and case study analyses of NOAA experimental HWRF products such as HWRF-HYCOM, HEDAS, and basin-scale HWRF. Tropical cyclone-tornado research from a previously funded AOML grant provided leverage in the validation and analyses.

An Interactive Sea Level Model (GeoCoast) has been developed. Lidar data collected in 2015 for the 3 coastal counties of Mississippi were used to develop a 10-ft resolution DEM (digital earth model) as a base for assessing the impact of sea level rise on the road network. A road centerline dataset, developed in an earlier MDEM (Mississippi Digital Earth Model) award, was merged with the elevation raster cells to transfer elevation measures to segments of the road centerline dataset.
A web-based GIS (GeoDawg) has been developed with the general public in mind. Popular spatial datasets (e.g., census of population, economics) may be accessed with a collection of commonly used GIS tools.

Studies are ongoing in support of NOAA's Healthy Oceans goal.

Research on the endangered smalltooth sawfish continued and provided new insights into their mating grounds. During the reporting period, 12 large juveniles and adults of the endangered smalltooth sawfish were captured and tagged. This is the first time researchers have captured adult males and females together in the three different regions, during the same season. Interestingly, all three adults captured in Coot Bay showed very fresh signs of mating, with wounds and scars from rostral teeth on the dorsal and ventral surfaces. This is the first time that mating grounds have been verified. In addition to numerous news reports, the findings will also be included in Shark Week 2017.

Photo Credit: Georgia Aquarium

Research continued with expanded water quality sampling in tributaries and estuaries in the Northern Gulf of Mexico. This research is creating a baseline trace element and strontium isotope map of primarily the Pearl River and also a few of the rivers draining into Lake Pontchartrain. This map will be used to better understand habitat use of Gulf sturgeon in the system and will be used in conjunction with data previously collected in the Alabama and Florida panhandle in the eastern NGOM.

An evaluation of the applicability of using UAS for oil spill detection in the Gulf of Mexico is currently underway. The focus of this task is to use an ultraviolet light source to "excite" hydrocarbons associated with oil deposits on the sea surface.

A proceeding report from the 6th Annual Hypoxia Research Coordination Workshop was completed, identifying the partners and mechanisms necessary to implement and sustain a Cooperative Hypoxic Zone Monitoring Program. The complete report is available at: https://www.ncddc.noaa.gov/activities/healthy-oceans/gulf-hypoxia-stakeholders/workshop-2016/proceedings/. An ongoing project with the objective to provide a range of realistic scenarios of future environmental changes in the northern GoM (including the shelf region) for the research community and fisheries resource managers continues to develop the regional ocean model (GOM8). GOM8 reproduces reasonably well main circulation and hydrographic patterns, such as the Loop Current, mesoscale eddies, hypoxic region over Texas and Louisiana shelves, SST, and surface chlorophyll for a comparison between model

and satellite chlorophyll). Modeling of small and large plankton components allows a better representation of ecological processes in the coastal and oceanic domain. Seasonal variability of phytoplankton biomass shows significant regional differences across the northern GoM. The next phase of this project will be to obtain future projections over the 21st century of physical & biogeochemical processes in the northern GoM under a high and a medium-to-low CO_2 emission scenario using the model configured from task 1 and projected atmospheric fields from the Coupled Model Intercomparison Project phase-5 (CMIP5).

The analysis of the Biscayne Bay water quality data indicated that following a significant bloom of a picophytoplankton (Synechococcus) in September of 2005, the oligotrophic system had shifted to a more phytoplankton dominated system than the benthic/submerged aquatic vegetation system that dominated prior to the 2005 bloom. Results of this analysis (with others ongoing) are being used to develop process studies for additional data collection that will be incorporated into a coupled hydrodynamic model for ecological assessments that will be used to inform watershed management and habitat restoration decisions.

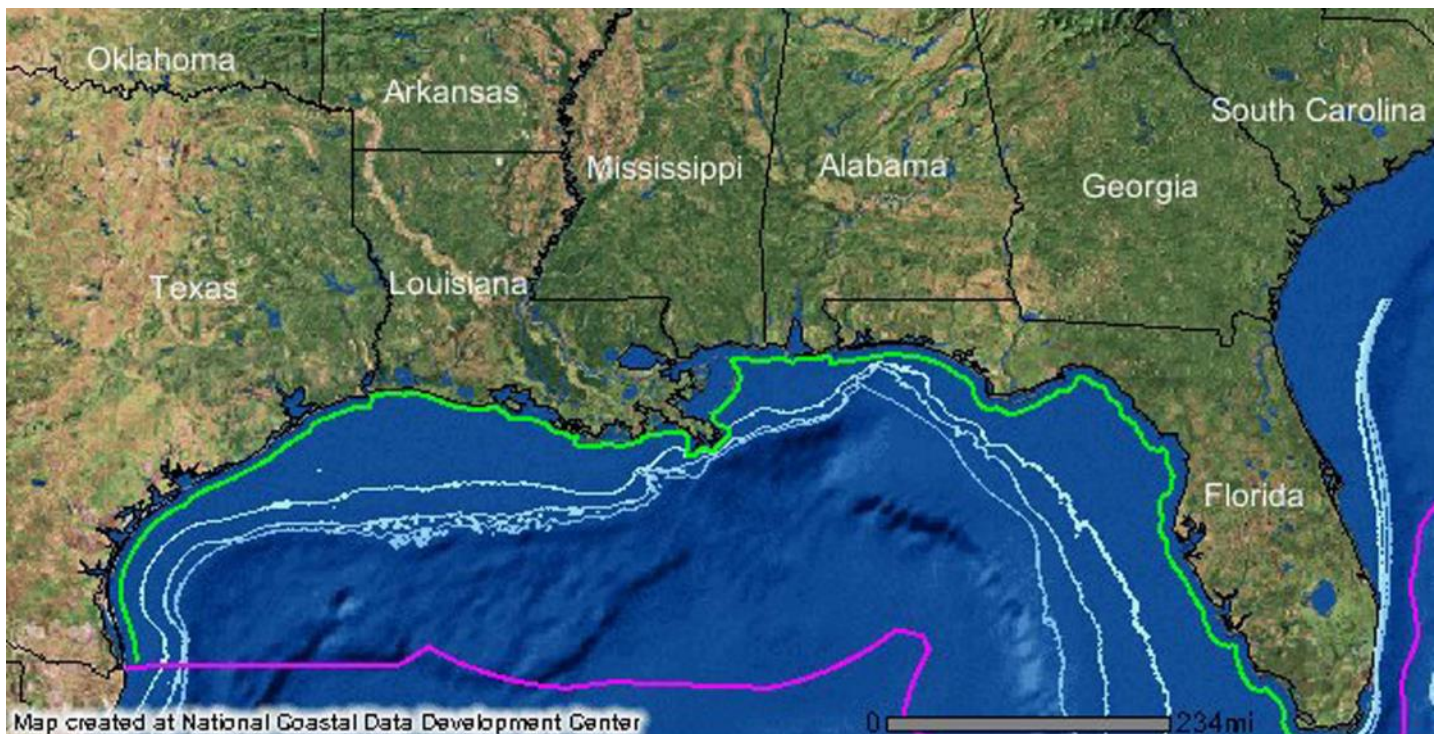Map created at National Coastal Data Development Center

Photo Credit: Georgia Department of Natural Resources, A wildlife biologist from Georgia's Department of Natural Resources, surveying oiled sargassum seaweed in the Gulf of Mexico after the Deepwater Horizon oil spill in 2010.

Calibration and validation of ocean products on NOAA VIIRS for monitoring oceans continued with several outcomes. As a result, new ocean products have been developed from the VIIRS orbital overlap and have been validated. Measurements of diurnal changes in ocean color in turbid coastal regions in the Gulf of Mexico were characterized using above water spectral radiometry. Protocols were developed for collection and processing of in situ optical data used for ocean color calibration and validation. These included the IOP floating hyperpro and above water ASD instruments. Results of protocols and all data from the ocean color cruises were transitioned to NOAA and put into cruise reports. The WavCIS platform is transitioning daily data to NASA and NOAA for calibration and validation of the Ocean Color on VIIRS satellite. These data are being used for maintaining high quality VIIRS products.

Photo Credit:
NASA image by Norman Kuring, using VIIRS data from the Suomi National Polar-orbiting Partnership.

Autonomous underwater vehicle (AUV) in foreground.
NOAA Ship RONALD H. BROWN in background.

Stock Photo Credit: Lieutenant Elizabeth Crapo, NOAA

Data management activities with an emphasis on product development were initiated.

An enduring mapping center to address research and development needs that advance the science and practice of hydrography and cartography has been established at the University of Southern Mississippi. The research plan encompasses five thrusts (e.g. Sensors/Platforms, Positioning, Water Levels, Data Management, Data Portrayal). An initial effort included the use of Lidar data for several significant sections of the Northern Gulf Cast for comparison to shorelines depicted on existing charts.

The Continuation of Comparative Metagenomics to Indicate Sites Under Anthropogenic Pressure project has greatly reduced a backlog of previously acquired data sets. Bioinformatic analysis of several new projects to serve core missions of NOAA was initiated. Preparations were initiated to embark on field operations to test the viability of 1) environmental sample processors on AUVs to match the sampling fidelity of shipboard sampling, 2) larval community metabarcoding to match the fidelity of manual counting, and 3) free environmental DNA as a proxy for recent fish population counts.
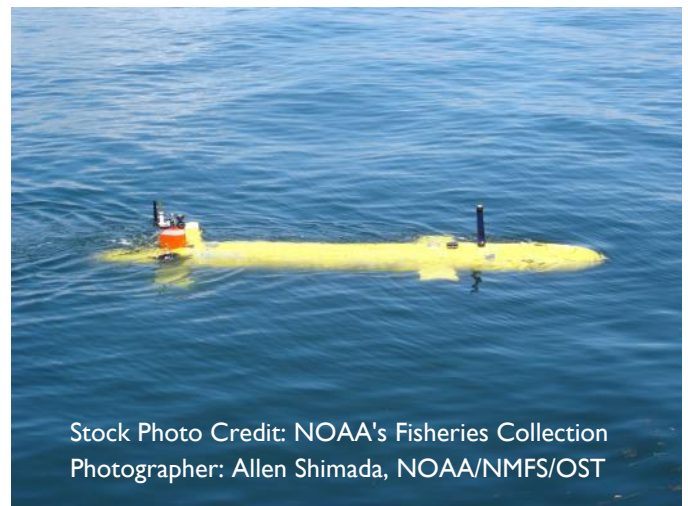
Stock Photo Credit: NOAA's Fisheries Collection
Photographer: Allen Shimada, NOAA/NMFS/OST

This instrument is capable of operating at 2200 meters depth, has a multi-beam sonar system, conductivity-temperature-depth sensor (CTD), and can mount mission specific

Since 1988, thousands of volunteers gather in the fall to remove millions of pounds of trash from Mississippi's coastline, waterways, and barrier islands. Additionally, these volunteers help collect data that are used to categorize the major sources of marine debris entering the coastal environment.

Mississippi Coastal Cleanup is a partnership between the Mississippi State University Extension Service and the Mississippi Marine Debris Task Force. It is a part of the International Coastal Cleanup and is one of the largest volunteer efforts in all of Mississippi.

The 2017 Mississippi Coastal Cleanup will be held October 21. Please visit mscoastalcleanup.org if you're interested in volunteering, sponsoring, or learning more about cleaning up our coast!

The Mississippi Coastal Cleanup is a partnership between the Mississippi State University Extension Service and The Mississippi Marine Debris Task Force. These organizations collectively form the Coastal Cleanup Program Team, which is responsible for implementing the Coastal Cleanup Program.
The Mississippi State University Extension Service has been a partner on the Coastal Cleanup Program since July 2016.

The Mississippi Marine Debris Task Force has been in existence since 1988 and is responsible for organizing and oversight of the annual coastal cleanup event. The Task Force is composed of volunteers and community leaders from many nongovernmental environmental organizations; from many federal, state, county, and city governmental agencies; from several federal and state military service branches; from many coast business organizations; and from several community service organizations.

University of Southern Mississippi Unmanned Maritime Systems (UMS) Certification

Autonomous vehicles are becoming increasingly involved in routine, innovative, and emergency data collection in the marine environment yet few curricula exist worldwide to train operators for this equipment. This certification will provide students with a working knowledge on the operation of a variety of autonomous marine survey vehicles and to help them to understand the environment in which vehicles operate and how that environment factors into decisions and mission planning.

Students will learn foundational material upon which to build more detailed training on specific platforms, including UUVs

(Unmanned Undersea Vehicles including powered vehicles as well as gliders) and USVs (Unmanned Surface Vehicles) intended to provide sufficient background to safely and efficiently operate these vehicles in challenging marine environments. AUV's examined include the ISE Explorer Class AUV, the Woods Hole Seabed AUV, the Bluefin AUV, both Webb and Kongsberg gliders, and Navy vehicles such as the IVERS AUV and Wave Glider. In addition, students will be provided electronic workstations and glider kits to assemble and test.

If you are interested in the USM program, please send an email to Marine Science or contact us at (228) 688-3177.

Governor Visits Mississippi Coast to Create Ocean Task Force

Gov. Phil Bryant was on the Mississippi Coast in June to formally create an ocean task force.

The announcement was made at the Battlefield Airmen Center at the Combat Readiness Training Center in Gulfport at an event that involved the Naval Meteorology and Oceanography Command at Stennis Space Center and a "technology showcase" by the Stennis-based Mississippi Enterprise for Technology, a private nonprofit formed by the state, NASA and the state Institutions of Higher Learning.

The demonstration of "unmanned systems" provided an opportunity for the U.S. Navy, academia, and industry to demonstrate existing unmanned capabilities, showcase local infrastructure, and explore collaborative opportunities in support of national defense."

At the event, the University of Southern Mississippi's Stennis-based, Division of Marine Science introduced a certification program to train operators of marine drones.

"Programs like those developed by the University of Southern Mississippi and the National Data Buoy Center are critical for expanding and diversifying the state's economy," said Robbie Ingram, CEO of the Mississippi Enterprise for Technology. He also stated that "Stennis Space Center has the highest concentration of oceanographers in the world, and the world-class training and education being delivered here continues to develop and expand our highly-skilled blue economy workforce."

The Navy has been developing underwater drones that could patrol the world's seas along a network it calls "the Eisenhower highway," which eventually could include refueling stations that would allow the unmanned craft to stay at sea for months at a time.
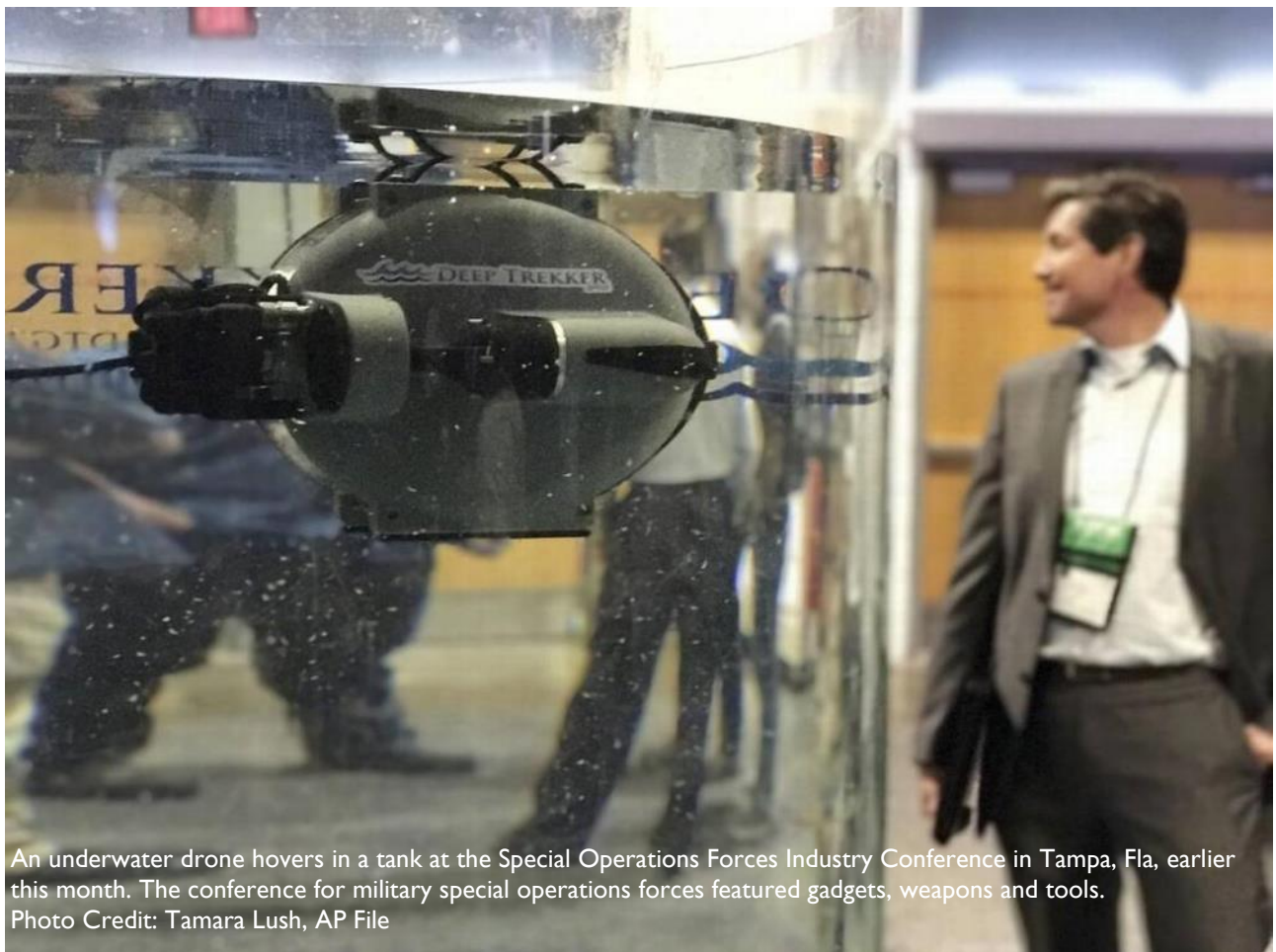
An underwater drone hovers in a tank at the Special Operations Forces Industry Conference in Tampa, Fla, earlier this month. The conference for military special operations forces featured gadgets, weapons and tools.
Photo Credit: Tamara Lush, AP File

Researcher Profile
Mississippi State University

Pat Fitzpatrick, Ph.D.
Northern Gulf Institute
Faculty

Fitzpatrick is an associate research professor at Mississippi State University (MSU) since 2001, an adjunct professor Jackson State University, scientific consultant, and weather forecaster. He is currently interacting with NOAA's Hurricane Research Division and National Centers for Environmental Prediction conducting analysis on state-of-the-art hurricane prediction.

Development is ongoing for new validation techniques and improving ocean interface software for improved wind an structure prediction. He is also a forecaster during hurricane season, developer of storm surge prediction software, hurricane historian, and instructor through his website weatherclasses.com.

His MSU research has encompassed: tropical cyclone intensity and structure research; numerical modeling; data assimilation; model validation; severe weather; storm surge; Gulf Coast sea breeze climatology; wetland studies; trajectory modeling of the Deepwater Horizon oil spill; co-PI of the CONsortium for COastal River-Dominated Ecosystems (CONCORDE); tropical cyclone history; and miscellaneous atmospheric science activities. These interests overlapped a NASA incubator program at Stennis Space Center which resulted in the commercialization of storm surge, ocean, and weather products at WorldWinds, Inc., WXWORX, Barons, and Q-risq Analytics. As a consultant, he has collaborated on oceanography, tropical cyclone, and weather projects with Taylor Engineering, the Nuclear Regulatory Commission, Ocean Weather, Woods Hole, WeatherFlow, and The Southeast Louisiana Flood Protection Authority

- East levee board. He has authored or co-authored peer-review journal articles, encyclopedia articles, book chapters, technical reports, conference preprints, and two books.

Prior to MSU, he was an associate professor of meteorology at Jackson State University from 1995-2001. In 2016, he resumed teaching online classes at JSU as an adjunct professor. Classes include synoptic meteorology lab/lecture, numerical methods, and dynamics through his website weatherclasses.com .

He holds positions on the National Hurricane Conference Hurricane History Committee, the STAC Committee on the Coastal Environment for the American Meteorological Society, and the East St. Tammany Parish Storm Protection Committee. He is on the National Hurricane Museum & Science Center advisory panel. For 2015-2016, Governor Bobby Jindal appointed Fitzpatrick a commissioner to the St. Tammany Levee, Drainage, and Conservation District Board.

Fitzpatrick earned a B.S. and M.S. in meteorology at Texas A&M University in 1988/1992, with a thesis on numerical modeling of hurricane genesis. His doctorate work was performed at Colorado State University under Dr. Bill Gray, with a dissertation on satellite applications to predicting hurricane intensity. While a graduate student, Fitzpatrick was employed as a graduate teaching assistant, classroom instructor, lab assistant, computer consultant, and hurricane forecaster. Fitzpatrick owns a patent for a multivariate statistics graphics package using parallel coordinates.

Researcher Profile
University of Southern Mississippi

Frank J. Hernández , Ph.D.
Assistant Professor
Division of Coastal Sciences

Hernández's research focuses on fisheries oceanography, with an emphasis on the early life stages (fish eggs, larvae and juveniles).

Hernández's specific interests include biological and physical processes that influence recruitment dynamics (e.g., vertical distribution behaviors, cross- and along-shelf transport), biological-physical coupling in marine environments, larval fish ecology, and ichthyoplankton identification and taxonomy. Within this framework he is also interested in how larval fish behaviors, physical transport and vital rates are affected by climate variability and natural and anthropogenic disturbances.

Begins Oct 21, Volunteer Now

Researcher Profile
University of Alabama in Huntsville

Kevin Knupp, Ph.D.
Professor
Atmospheric Science Department

A professor of atmospheric science, Knupp leads the university's severe weather research group, studying lightning, tornadoes, thunderstorms, gust fronts, dry lines, land-falling hurricanes, topographic effects, blizzards and other such things.

Knupp received his Ph.D. in atmospheric science from Colorado State in 1985, the same year he came to UAH as a research scientist in what was then the Remote Sensing and Atmospheric Science Lab run by Dr. Dick McNider.

Education
1977 - B.S. Meteorology,
Iowa State University (graduated with distinction)
1980 - M.S. Atmospheric Science,
Colorado State University
1985 - Ph.D. Atmospheric Science,
Colorado State University

Research Interests
Radar Meteorology
Cloud Processes
Boundary Layer Processes
Severe Storms and Lightning
Hurricanes

Researcher Profile
Florida State University

Mark Bourassa, Ph.D.
Associate Director
Center for Ocean-Atmospheric Prediction Studies
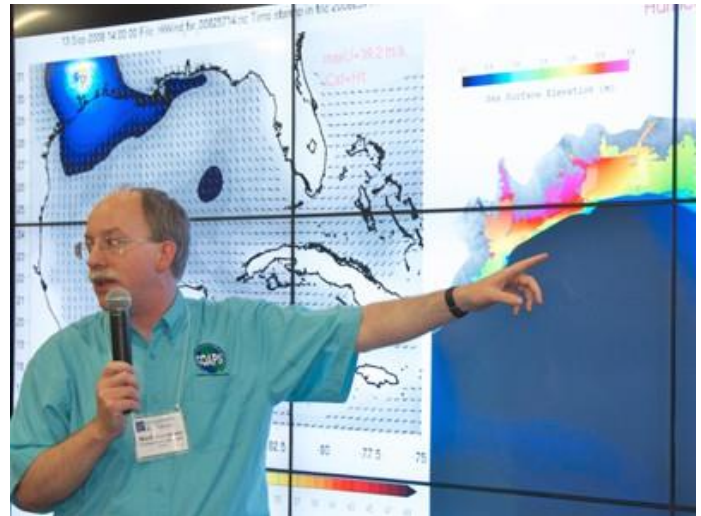*Professor of Meteorology*
Department of Earth, Ocean and Atmospheric Science

Bourassa's main research interests are air/sea interaction, remote sensing related to air/sea interaction and precipitation, and data fusion. These interests are applied to a wide range of activities (e.g., tropical disturbances, diurnal variability in surface fluxes and related variables, decadal variability in surface fluxes, impacts of episodic ocean forcing, and physical models of energy and momentum exchange between the ocean and the atmosphere).

Automated Meteorological and Oceanographic Systems (SAMOS) Working Group, the SEAFLUX Working Group, and the NOAA Expert Team on the State of the Ocean. These groups endeavor to improve our knowledge of air/sea interaction and its consequences on the larger Earth/Atmosphere/Cryosphere/Ocean system, with a wide range of applications.

Bourassa is particularly fond of using in situ and remotely sensed observations, combined with models of the atmospheric boundary-layer, to better understand air/sea interaction and the surface characteristics to which a scatterometer responds.

Bourassa is currently a faculty member in the Department of Meteorology, and a member of the Center for Ocean-Atmospheric Prediction Studies (COAPS) and the Geophysical Fluid Dynamics Institute. He also served as the team leader for the NASA Ocean Vector Wind Science Team; and co-chairs the US CLIVAR working group on high latitude surface fluxes; and is an active member in Shipboard

Researcher Profile
Dauphin Island Sea Lab, Alabama

Brian Dzwonkowski, Ph.D.
Senior Marine Scientist I
Assistant Professor

Dzwonkowski is interested in physical processes that influence three-dimensional transport in the coastal ocean as well as how this transport impacts marine ecosystems.

Circulation and transport processes on coastal shelves and in estuaries provide a pathway for mass property and material exchange, which can have a critical impact on the state of a marine system. This is a challenging (but very interesting) region to study as a result of there being a broad scope of interacting forcing functions that operate on a wide range of temporal and spatial scales in conjunction with an irregular physical environment (i.e. bathymetry and coastal geography). This results in complex flow fields. As such, his research has focused on improving the understanding of the flow field and its associated response to forcing functions at a range of temporal and spatial scales. By examining estuarine and coastal circulation, I hope to provide a more complete understanding of the processes that dictate the origin, fate, and residence time of material in the coastal ocean.

Another aspect of his research involves linking these physical processes to biological aspects of marine system ecosystems. As systems becoming more strongly influenced by anthropogenic impacts, identifying and understanding environmental controls over marine life cycles is essential to elucidating the inter-annual variability that characterizes biological systems.

Through his research efforts, Dzwonkowski has also developed a keen awareness of the need to acquire high resolution data on estuarine and coastal physical processes due to the importance of these regions' ecosystems and their relatively sensitive nature. As such, coastal ocean observing systems provide a critical tool in the efforts of understanding the variability in these systems by providing unprecedented temporal and spatial views of coastal currents and hydrographic conditions. The continued maintenance and expansion of these observing systems require both operational and scientific justification. Thus, my research focuses on demonstrating new science based on the data provided from these observing systems.

In addition Dr. Dzwonkowski has two graduate students who assist him in his projects,

Jeff Coogan:
Jeff's research interest are focused on estuarine circulation and dynamics. The complex interactions of tides, river discharge, and wind can make predicting salinity changes, currents and physical interactions in estuaries difficult. Theoretical approaches are continually being refined in light of new data based on how to best simplify, parameterize, and understand estuarine physical dynamics. Stratification and mixing are also important characteristic of the flow structure in Mobile Bay and he is examining methods to better understand how this stratification modifies exchange flow. This work has important implications for understanding the relative importance of physical forcing conditions on dissolved oxygen dynamics, which often contributes to hypoxic conditions (i.e. poor water quality).

Steve Dykstra:
Steve's research interests focus on estuarine and coastal processes that link fluvial and marine environments. Coastal regions with fresh water sources are complex environments due to the large density gradients and tidal-morphology relationships, that together lead to estuarine-terrestrial material transport and high ecological productivity. He is particularly interested in better understanding the impacts of river discharge on a range of physical processes including tidal propagation in estuaries, estuarine-shelf exchange, and river plume dynamics. The interaction between river discharge and these physically processes are critical to improving the understanding the coupled relationship between hydrodynamics and the associated geomorphology of a system.

In the News:
NGI Researchers' Work: When Invasive Plants Attack, a New Tech Tool Can Nip it in the Bud

A couple of years ago, a group of Mississippi State University researchers were using new technology to map the Lower Pearl River delta for forecasters when they saw an alien species — of plant, that is.

An invasive plant species called Phragmites Australis, also known as Common Reed, is a tall grass that can be found along coastal areas of the Gulf of Mexico. This invasive Phragmites is a problematic weed in many states because it forces out native plants in those areas by outcompeting them for resources such as space, sunlight, water and nutrients.
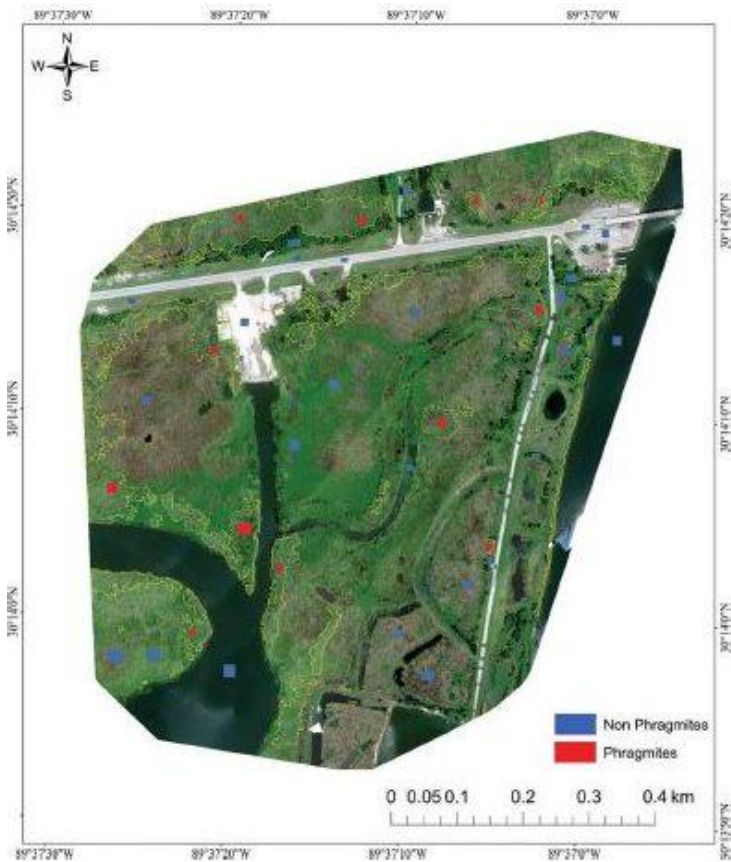
It can also alter wetlands ecosystems and increase the potential for fire. Typically growing to around 16 feet, a full-grown plant can make navigation and visibility difficult for small boats.

Gray Turnage and Sathish Samiappan, who are both research associates at Mississippi State University's Geosystems Research Institute, said they participated in a river mapping project using a special drone and cameras such as a multispectral camera—technology can see what the human eye cannot—attached to collect data.

Turnage said the invasive grass had been growing along the Gulf for many years, but suddenly, using this type of image technology, he could clearly see the areas this plant occupies.

There are Phragmites that are native to North America, but two types of Phragmites are considered invasive.

One type, Haplotype M, can be found along the East Coast and Northern states and is native to Europe. The other type, Haplotype I, is found along the Gulf Coast. Its origin is unknown, but it is suggested to be native of South America or Asia.

Turnage said it would be impossible to verify how the invasive plant found its way to the Gulf Coast. However, invasive species are likely to arrive via travel corridors, like shipping containers, harbors and occasionally airports.

Locating where this invasive species populates is time-consuming and difficult to do manually. The software Turnage and Samiappan used for their drone technology is capable of giving a map of the GPS locations of where the plant is.

"Once you teach it how to identify the target species that you're after, it can find that species with a high degree of accuracy," Turnage said. "In the rest of the imagery, what's collected by that drone, you could hand that over to a resource manager and they can use that for decision-making purposes when they try to manage a specific species.

Turnage said this camera technology can identify much more than invasive and native plant species. It can monitor crop health and damage signs from animals, among other things. This drone technology could also be used while maintaining forests around the state via prescribed fire.

"It's growing quicker in the agricultural field, crop science and things like that," Turnage said. "It's catching up in the natural resources field, what we call … forests, wetlands and marshes, but still behind other fields of research."

Turnage said many types of items can be mapped as long as a drone can see the item from the sky. This works well for plants not shaded by trees. It can capture images of invasive animals, too, but they are able to move around, so locating those animals on the ground would still be tricky.

Story by Kendra Ablaza Mississippi Today
Follow her on Twitter: @KendraAblaza.

Samiappan developed the software used for capturing the imagery during their research. He said satellite data could also produce similar visuals to aid in locating specific plant species.

Getting that detailed data, however, could take as long as two months.

"Satellites don't see the same spot on the ground all the time," Samiappan said. "They revolve around the earth, so there is a time lapse between when you want to collect the imagery and when you can actually get the imagery."

The researchers are further testing this method to make sure it consistently works on a wide variety of problems.

Courtesy of Sathishkumar Samiappan, Gray Turnage, Lee Allen Hathcock and Robert Moorhead.
The drone used during the Mississippi State University's Geosystems Research Institute project on invasive grass along the Gulf of Mexico called Phragmites australis or common reed.

Turnage said the goal is for government agencies, resource managers and farmers to use this method so it can help them do their jobs more efficiently.

This can range from searching for damaged or stressed crops in a large field to take corrective action, to making more-informed decisions about nature preservation around the state.

Should the method meet their standards, Turnage, Samiappan and others would get the message out by giving presentations on their findings and publishing their work in peer-reviewed publications.

"It could be used to increase safety in certain areas," Turnage said. "Humans still have to act on the data. The drones won't do it for you, but it can tell you where action needs to be taken."

About Mississippi's Invasive Plants:

Invasive plant species are introduced species that live beyond their normal range and that have characteristics that are detrimental to their new location. These troublesome plants are adaptable, aggressive, have a high reproductive capacity, and generally lack natural enemies in their new location. These characteristics lead to outbreaks in which the invasive plant species may degrade or eliminate habitat for native species, both plant and animal.

Mississippi's Invasive Plant Species

Alligatorweed
Amur honeysuckle
Beach vitex
Benghal dayflower
Bushkiller
Catclaw mimosa
Chinese privet
Cogongrass
Common waterhyacinth
Common Reed
English ivy
Eurasian watermilfoil
Garlic mustard
Giant reed
Giant salvinia
Hairy galinsoga
Hydrilla
Itchgrass
Japanese climbing fern
Japanese honeysuckle
Japanese privet
Johnsongrass
Kudzu
Large crabgrass
Multiflora rose
Musk thistle
Nepalese browntop
Parrotfeather
Purple loosestrife
Roundleaf toothcup
Sacred bamboo
Showy rattlebox
Silktree
Smutgrass
Southern crabgrass
Spiny cocklebur
Tallowtree
Thorny olive
Tree of heaven
Tropical soda apple
Wisteria

Beach vitex
Benghal dayflower
Cockspur pricklypear
Curlyleaf pondweed
Devils tongue pricklypear
Erect pricklypear
Eurasian watermilfoil
Giant salvinia
Itchgrass
Multiflora rose
Parrotfeather
Pricklypear cactus
Purple loosestrife
Tallowtree

For more information about local invasive species please visit:
http://www.gri.msstate.edu/research/invspec/

Post-Doc, GIS-Analyst and Ph.D Assistantship Positions Announced Through the Strategic Conservation Assessment of Gulf Coast Landscapes Project

The Strategic Conservation Assessment of Gulf Coast Landscapes (SCA) Project Team announces the availability of three positions to support the SCA project. These positions are for a Postdoctoral Associate in Ecological Modeling, a Geospatial Analyst Research Associate, and a Ph.D. Student in Coastal Ecological Modeling and Geospatial Application Development.

The Restore Council approved the SCA project as one among a suite of projects in the 2015 initial Funded Priorities List. This project will coalesce existing conservation and socioeconomic priorities into conservation planning decision support tools to aid the Restore Council and their stakeholders in identifying high priority lands for voluntary conservation efforts. The SCA project is being led by the U.S. Fish and Wildlife Service Gulf Restoration Team and administered through a cooperative agreement with Mississippi State University, with support from the four Gulf Landscape Conservation Cooperatives. More information on the SCA project is available in the project summary.

Position Descriptions
Postdoctoral Associate in Ecological Modeling

The SCA project team is seeking a Postdoctoral Associate in Ecological Modeling to be based out of the Department of Agricultural and Biological Engineering at Mississippi State University. The Postdoctoral Associate must hold a Ph.D. in biological or environmental engineering, geography, geosciences, ecology, environmental science/management, or other related fields. ABD candidates will also be considered. The ideal candidate will have some combination of the following skills: spatially explicit ecological modeling, landscape conservation, MCDA, programming (especially Python), and web-based app development. Expertise with geographic information systems (GIS) and other related software applications and technologies is also required. Additional information and detailed submission instructions can be found in the Post Doc Position Description. Review of applicants will begin June 7, 2017. If you have any questions, are interested in submitting an application, or have a suggested candidate, please contact Anna Linhoss (alinhoss@abe.msstate.edu). Applicants must complete an application through the MSU HRM website to be considered, but should also email a copy of the cover letter and resume/CV directly to Anna Linhoss.

Research Associate – Geospatial Analyst

The SCA project team is seeking a Geospatial Analyst Research Associate to be based out of the Department of Wildlife, Fisheries & Aquaculture at Mississippi State University. The applicant must hold minimally a B.S. in geography, geosciences, ecology, environmental science/management, coastal or marine ecology, wildlife and fisheries science, or other related fields and minimum of 3 years of relevant experience and the equivalent of a master's degree; or a M.S. degree and minimum of 1 year of relevant experience and demonstrated competency. A strong background and expertise with geographic information systems (GIS) and other related software applications and technologies is required. The ideal candidate will also have some combination of experience developing web-enabled geospatial data applications, expertise in other GIS software applications and html programming applications, as well as experience working in Gulf Coast landscape conservation, large-scale data applications, spatially explicit ecological modeling, multi-criteria decision analysis, and interacting with stakeholders. Additional information and detailed submission instructions can be found in the GIS Analyst Position Description. Review of applicants will begin June 7, 2017. If you have any questions, are interested in submitting an application, or have a suggested candidate, please contact Kristine Evans (kristine.evans@msstate.edu). Applicants must complete an application through the MSU HRM website to be considered, but should also email a copy of the cover letter and resume/CV directly to Kristine Evans.

Ph.D. Student in Coastal Ecological Modeling and Geospatial Application Development

The SCA project team is seeking a Ph.D. student to be based out of either the Department of Agricultural and Biological Engineering or the Department of Wildlife, Fisheries & Aquaculture at Mississippi State University. The student will work with SCA staff to develop a suite of ecological models and associated geospatial applications predicting ecosystem, species, and/or socioeconomic response to potential Gulf Coast system stressors and planned coastal restoration activities. The Ph.D. student must hold a Master's degree in geography, geosciences, ecology, environmental science/management, biological/environmental engineering, coastal or marine ecology, wildlife and fisheries science, or other related fields with competitive GPA and GRE scores. Research experience with predictive ecological modeling and geographic information systems (GIS), and a demonstrated publication record are preferred. Additional information and detailed submission instructions can be found in the Ph.D. Student Position Description. Review of applicants will begin June 7, 2017. If you have any questions, are interested in submitting an application, or have a suggested candidate, please contact Kristine Evans (kristine.evans@msstate.edu) (Department of Wildlife, Fisheries and Aquaculture) or Anna Linhoss (alinhoss@abe.msstate.edu) (Department of Agricultural and Biological Engineering) at Mississippi State University.

Education and Outreach

Gulf Detectives

Produced by Alabama Public Television and filmed at the Dauphin Island Sea Lab, earned an Emmy at the 43rd annual Southeast Emmy Awards.

Experts at the Dauphin Island Sea Lab guided three young science 'detectives' on a mission to learn more in the interactive field trip Gulf Detectives: Animals of the Northern Gulf of Mexico in October 2016. The student detectives learned about oysters, oyster reefs, and explored the restoration of the oyster reefs around Coffee Island with The Nature Conservancy. They also got dirty in the marsh mud learning about the creatures that live there and how those creatures can help us understand the health of the Gulf of Mexico's ecosystem.

Photo/Story Credit: pbs.org/video/2365965758/

More than 62,000 students worldwide participated in the live interactive field trip by asking their own questions and participating in polls.

The episode offers teachers a great way to address the disciplinary core ideas in the Life Sciences including From Molecules to Organisms: Structures and Processes; Unity and Diversity; Ecosystems: Interactions, Energy and Dynamics and Earth and Human Activity. Students will see examples of animal habitats, animal adaptations, food webs, and ecosystems, as well as human impacts and potential solutions.

Discovery Hall Programs

Discovery Hall Programs promote conservation through education, research, and outreach. By increasing public awareness and understanding of the ocean, people will respect and protect marine environments. Through hands-on activities in vibrant marine habitats, people can see the impact of science on their daily lives. More than 15,000 students a year participate in Discovery Hall Programs via academic year programs and summer camps. For more information please visit DISL.org

Summer Internships Available

To apply, please send cover letter, intern application form, (available at disl.org) and current student transcripts to dhpsummer@disl.org with the subject line, *Discovery Hall Summer Internship*.
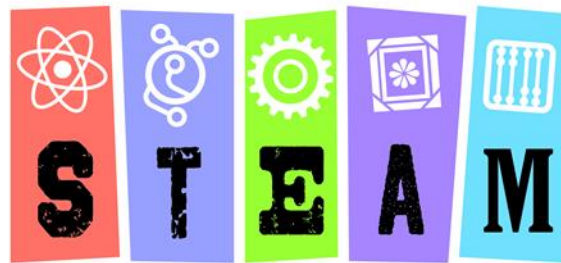
STEAM fields are science, technology, engineering, and mathematics, together with art. STEAM is designed to integrate STEM subjects and the art of design in education.

STEAM programs add art to STEM curriculum by drawing on design principles and encouraging creative solutions.

In 2013, a joint resolution was introduced in the United States House of Representatives expressing the sense that adding art and design into Federal programs that target the STEM fields encourages innovation and economic growth in the United States.

The Northern Gulf Institute (NGI) at Mississippi State University is proud to announce a STEAM art competition, where original drawings, paintings , photography, or other renderings, to be sized at 4.25 inches by 11 inches vertically, depicting the natural environment, marine avian, or aquatic species, the ocean, or weather, as related to the Mississippi River, The Gulf Coast, or the Gulf of Mexico Basin, are to be submitted for review. The winner of the competition will have their art featured in the "Portal" Newsletter.

This competition is presently limited to Starkville Area High School Art or Science Students, but will be rolling out to schools located near other member institutions in future publications.

> *"Innovation depends on the problem solving, risk taking and creativity that are natural to the way artists and designers think,"*
>
> *~ John Madea*

1st Quarter STEAM Art Competition Winner:
Caroline Matheny, 12th Grade,
Starkville, Mississippi

NGI
NORTHERN GULF INSTITUTE
a NOAA cooperative institute

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FLORIDA STATE UNIVERSITY
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1851

Dauphin Island Sea Lab
· Alabama ·

NGI Education & Outreach

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