IMPACTS

Sea Grant
Mississippi-Alabama

Impacts reported
by Mississippi-Alabama Sea Grant
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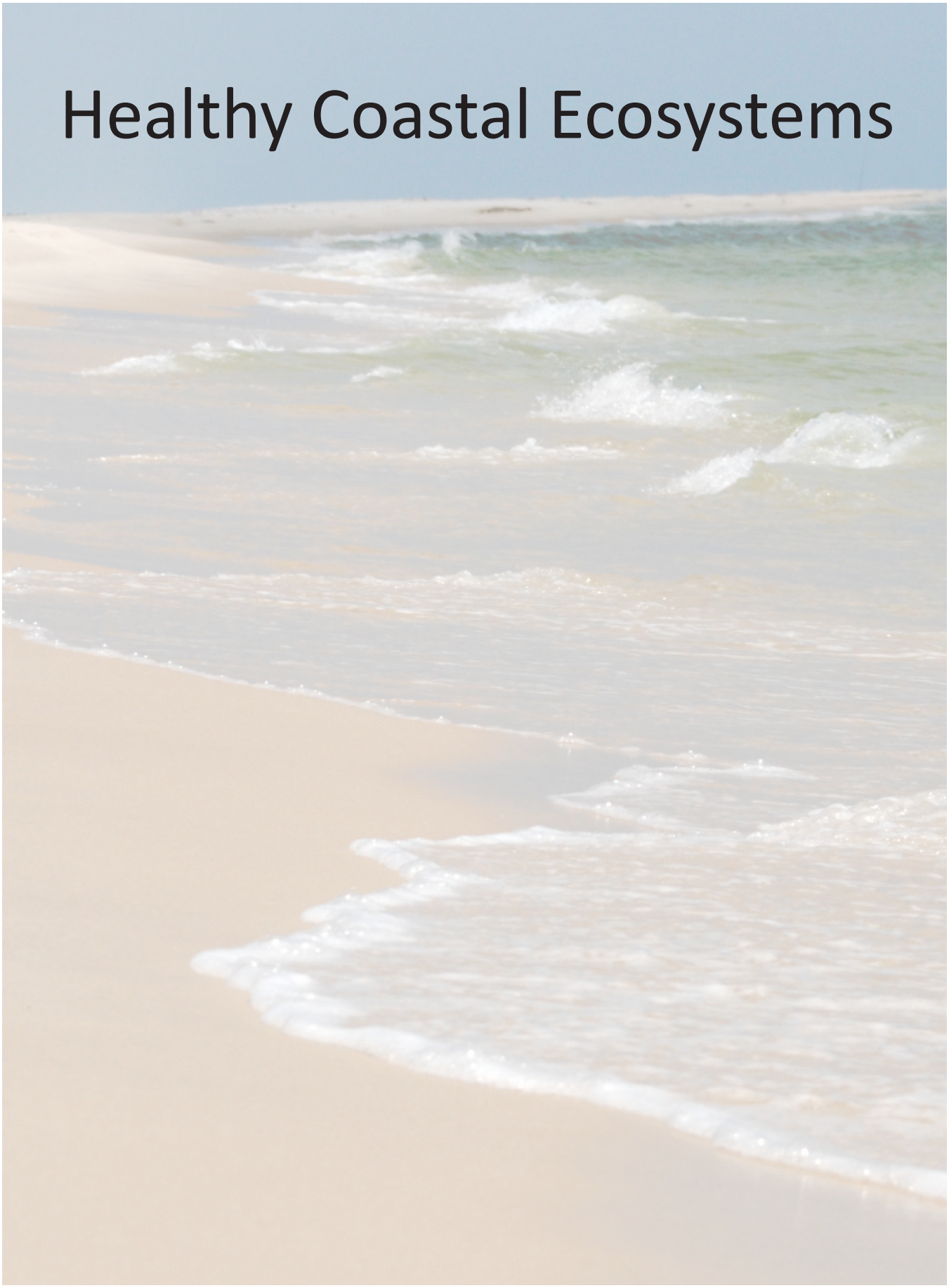


City of Prichard, Alabama, restores Reading Park Creek streambank

Relevance:
Reading Park Creek, which runs through a passive park in the City of Prichard, Alabama, was highly degraded due to stormwater runoff and pervasive invasive species. This creek is a tributary to Eight Mile Creek, which is listed on the state's 303(d) list of impaired waterways due to excessive amounts of pathogenic bacteria. The community members are predominantly African-American and historically underserved, and they value their environmental resources and desire more access and recreational opportunities, as evidenced by their participation in the development of the Eight Mile Creek watershed management plan.

Response:
Sea Grant-funded scientists and staff gathered public input and created a plan for the restoration of Reading Park Creek. City of Prichard workers removed invasive species, graded the stream banks and established a flood plain in Jackson Reading City Park. About 45 volunteers helped plant 3,000 native plants along the creek and in upland areas at the site, which is located in the Eight Mile Creek Watershed. The project created buffer zones 25 to 50 feet from the creek to allow pollutant-filtering plants to remain undisturbed.

Results:
The City of Prichard, Alabama, restored 300 linear feet (4.49 acres) of streambank along the creek in Jackson Reading Park using forested buffers to protect wildlife, remove sediment and filter pollutants. The ecosystem service value of the restored streambank and associated park is $449,000. Volunteer hours involved in this project were valued at $3,973.

Recap:
Mississippi-Alabama Sea Grant helped plan and implement the restoration of 300 linear feet along Reading Park Creek in Prichard, Alabama.

The Oyster Trail public art, education project supports oyster gardening program

Relevance:
The Mobile Bay Oyster Gardening Program is a volunteer-based project that focuses on education, restoration/enhancement and research by bringing the reef to the people. Since the program began in 2001, oyster gardeners have produced more than 800,000 oysters (enough to restore approximately 40.5 acres) for restoration and enhancement efforts within Mobile Bay. Additional volunteers and funding were needed to support these restoration efforts.

Response:
Mississippi-Alabama Sea Grant launched The Oyster Trail, an interactive scavenger hunt through Mobile and Baldwin counties in Alabama. The Oyster Trail currently has 28 5-foot-tall oyster statues that local artists have painted. A business, group or nongovernmental organization pays a yearly fee to sponsor an oyster on their property or in a public space. Each fiberglass oyster statue includes a fact plaque that displays information about oysters or estuaries. Maps and a scavenger hunt form (which includes a list of questions about the oyster facts) can be found around town or on The Oyster Trail's website. Proceeds from oyster sponsorships go to support the ongoing restoration efforts of the Mobile Bay Oyster Gardening Program.

Results:
Twenty-eight businesses, groups and NGOs are active sponsors of The Oyster Trail. Statues placed in 28 locations around Mobile Bay provide a visual reminder of our connection to the estuarine environment. They generated $103,742 in gross proceeds to support the trail and the Mobile Bay Oyster Gardening Program. In addition to the sites in Alabama, the Trail has expanded to include sites in Virginia and New Jersey, where local restoration efforts have capitalized on the success of the trail. Proceeds go toward material and logistical and equipment costs associated with gardening and planting efforts in Mobile Bay and Mississippi Sound.

Recap:
The Mississippi-Alabama Oyster Trail raises awareness and funds for the Mobile Bay Oyster Gardening Program's restoration efforts.

Oyster gardening programs provide 237,115 oysters capable of restoring 11.76 acres of reef habitat

Relevance:
Oyster reef degradation is an issue in terms of habitat loss, filtration loss and shoreline protection from erosive forces.

Response:
Oyster gardening programs in Alabama and Mississippi utilized volunteer gardeners to provide nursery protections to juvenile oysters which were relayed to restoration sites in Alabama and Mississippi. Oyster gardening has been a successful restoration and environmental stewardship program in the Mobile Bay estuary since 2001. Ecosystem services like regulating services and habitat services are secondary benefits from oyster gardening. Documenting these services using valid economic values provides a more accurate representation of the importance of oysters and the role they play in our estuaries.

Results:
From 2014-2017, the oyster gardening programs in Alabama and Mississippi produced 237,115 oysters with a mean height of 50.0 mm capable of restoring up to 11.76 acres. The programs included two schools and averaged 52 volunteer sites and 116 individuals (excluding students) each year. The value of this restorative effort exceeded $226,672. Also, the participants' 9,280 volunteer hours (estimated at one hour per week per volunteer for the season with an average value of $23.73/hour) were valued at $220,214, bringing the total project value to $446,886 for the four-year time period.

Recap:
An average of 116 volunteer gardeners per year from 52 sites per year produced 237,115 oysters capable of restoring up to 11.76 acres of habitat valued at $226,672 and a volunteer time value of $220,214 for a total of $445,886 in project value over the 2014-2017 period.

Resource managers refine plans for burning vulnerable high marsh areas, based on Sea Grant research

Relevance:
Habitat degradation caused by storm debris has decreased ecological services provided by coastal ecosystems and has altered their resilience to climate change. Research on storm and fire impacts, which are predicted to increase in frequency or intensity with climate change, can inform resource managers on methods strategies to sustain coastal ecosystems.

Response:
Mississippi-Alabama Sea Grant Consortium-supported researchers worked with Grand Bay National Estuarine Research Reserve (NERR) partners to assess the interactive effects of prescribed fire and hurricanes on a black needlerush marsh. This approach permitted an examination of multiple-factor interactions that influence ecological processes and ecosystem sustainability.

Results:
Mississippi-Alabama Sea Grant-supported researchers found that high marsh areas are more vulnerable to fire than other marsh areas because they accumulated highly combustible wrack after hurricanes, and the plants are therefore slower to recover following a fire. Resource managers for the state of Mississippi are using these research results to refine prescription plans for burning on state lands and minimize risks to potentially vulnerable high marsh areas. Response from low to high marsh was taken into account for a subsequent project, which was funded by the Environmental Protection Agency. In that study, scientists looked at response along an elevation gradient. As a result, the Grand Bay NERR now has a 3-5 year fire cycle, and a second NERR (Weeks Bay) now incorporates fire into their management plan.

Recap:
Managers at the Grand Bay National Estuarine Research Reserve make coastal management decisions based on Mississippi-Alabama Sea Grant-funded research on hurricanes and fire interactions in a black needlerush marsh.

Certified Mississippi Master Naturalists provide 6,407 volunteer hours, reach 104,708 people

Relevance: Lack of environmental knowledge often promotes poor stewardship of natural resources. Additionally, many environmentally conscious individuals are eager to provide volunteer service, but these opportunities are often difficult to find.

Response: The Mississippi Master Naturalist Program was formed with the mission of developing an organization of knowledgeable volunteers to help promote conservation and management of Mississippi's natural resources through education, outreach and service within their communities.

Results: Since 2015, the Mississippi Master Naturalist Program, led by a Mississippi-Alabama Sea Grant extension specialist, held five basic training courses, which led to the certification of 89 new Master Naturalists. These participants' environmental knowledge improved an average of 10 percent. Post-course evaluations showed that 100 percent of the students gained knowledge, and 100 percent of the students intended to apply their newly gained knowledge. The class cost was $200-$300, but participants indicated an average value of more than $1,000 for the knowledge gained. During this time, program participants documented 6,407 volunteer service hours valued at $154,473. Through these volunteer hours, participants reached or educated more than 104,708 people and directly improved 543 acres through stewardship activities ranging from volunteer water quality monitoring to creating hiking trails.

Recap: The Mississippi Master Naturalist Program has increased the awareness of environmental issues in Mississippi and Alabama and provided volunteer service to organizations that help promote environmental education and outreach.

Mississippi Coastal Cleanup Program

Relevance:
Litter is an issue that impairs the environment, stormwater infrastructure, tourism and industry along coastlines

Response:
In 2016, a Mississippi-Alabama Sea Grant-funded extension specialist took over coordination and training duties for the long-running Mississippi Coastal Cleanup Program with the mission of preventing and removing litter from the coastal environment through education, outreach, research and cleanup events. Previously, Mississippi-Alabama Sea Grant staff members had served on the event's Task Force.

Results:
Since 2016, the Mississippi Coastal Cleanup Program performed nine site captain trainings leading up to the annual Coastal Cleanup events. The cleanup program attracted 4,252 volunteers that contributed 14,519 volunteer hours to remove 27.1 tons of litter from the beaches, waterways, wetlands and roads of coastal Mississippi. The value of this volunteer effort exceeds $350,053. Additionally, data collection on the specific type of litter was conducted by volunteers to identify sources and design targeted prevention methods.

Recap:
The Mississippi Coastal Cleanup Program, coordinated by a Mississippi-Alabama Sea Grant extension specialist, removed over 27.1 tons of litter from the coastal environment while educating more than 4,252 volunteers and site captains interested in preventing litter from reaching coastal waterbodies.

Mississippi-Alabama Sea Grant living shorelines outreach efforts lead to protection of 950 acres

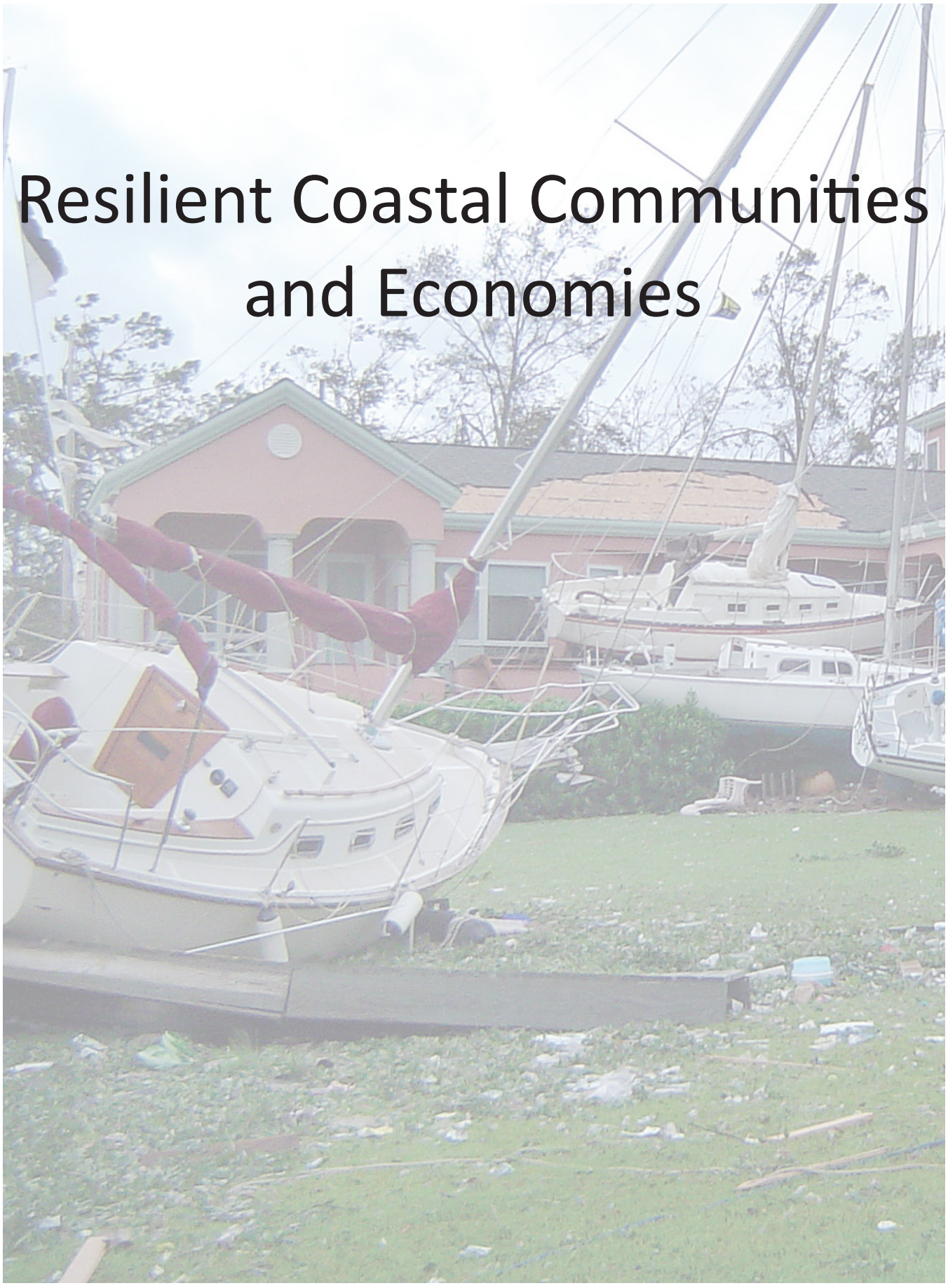
Relevance:
Erosion is caused by wind, water and wave action and results in loss of residential and commercial property, reduction of storm buffering capacity, aquatic and terrestrial habitat loss, increased suspended solids and water quality degradation. To combat these effects, property owners often harden their shorelines with bulkheads or seawalls. While these methods are somewhat effective at reducing erosion, they also are associated with continual maintenance and a loss of intertidal habitat. This intertidal habitat is extremely important for producing the ecosystem functions and services necessary to maintain a healthy coastal ecosystem.

Response:
The Mississippi-Alabama Sea Grant Consortium's Living Shorelines Program seeks out and evaluates alternatives to hardened shorelines, such as living shorelines, for environmental and economic benefits. This program uses the gathered information to produce outreach and extension materials educating a range of stakeholders from private property owners to government agencies about the pros and cons of different methodologies.

Results:
Since 2014, the Living Shorelines Program organized 16 workshops for resource managers and landowners and wrote, produced and disseminated 11 Extension publications focused on improving the effectiveness and ease of implementation for these projects. Extension education efforts informed decision-making on protection, restoration or enhancement of more than 8 linear miles of shoreline in Mississippi and Alabama by providing science-based information to environmental managers and property owners. The restoration efforts led to protecting about 950 acres with an annual ecosystem service value approaching S40 million by preserving these important marine habitats.

Recap:
Living shorelines education and extension efforts led to the protection of 950 acres of marine habitat with an annual ecosystem service value approaching $40 million.

Resilient Coastal Communities and Economies



Semmes, Alabama, includes low-impact development provisions in subdivision regulations

Relevance:
The City of Semmes is a newly incorporated city in the 8-Mile Creek watershed in Mobile County, Alabama, with a population of 3,015 people. The Semmes Planning Commission sought to foster future growth while preserving the rural character of the community. When the city became incorporated, 38 percent of the total acres and 15 percent of the total parcels of property in the city's jurisdiction was undeveloped. As a new city, the planning commission needed to develop planning documents and regulations that guided future development, yet ensured achievement of community goals, such as protecting streams, open space and fostering conservation development.

Response:
Mississippi-Alabama Sea Grant-funded researchers at Auburn University led the development of watershed models to predict water quality impacts of land use change. They also met with representatives from the Alabama Department of Environmental Management and Semmes city officials to discuss the benefits of low-impact development (LID). LID is an approach to land development (or re-development) that attempts to work with nature to manage stormwater as close to its source as possible. LID employs principles, such as preserving and recreating natural landscape features and minimizing effective imperviousness to create functional and appealing site drainage.

Results:
Sea Grant-supported researchers suggested several actions and policies that were incorporated into the Semmes Subdivision Regulations and city ordinances and revised in 2016. For instance, model stream buffer policies were adopted and are measured as follows: "Within 150 feet of a public drinking water source and any associated tributaries and/or wetlands; within 100 feet of streams and associated wetlands; and within 75 feet of natural drainage features and adjacent and/or isolated wetlands." These stream buffers and other policies will promote water quality, natural resource planning and low-impact development within Semmes. Due to the success of this Sea Grant project, Mobile, Alabama, updated their regulations using Semmes regulations as a model.

Recap:
Mississippi-Alabama Sea Grant researchers helped the City of Semmes develop and adopt subdivision regulations that focus on conservation, stream conservation, stream buffer and LID policies. The regulations have also informed regulation updates that the City of Mobile implemented.

Small grant awards support climate adaptation, resilience planning in 20 communities

Relevance:
Coastal communities lack the financial capacity and resources to proactively plan for long-term resilience and adapt to changes related to climate stressors.

Response:
Between 2014 and 2017, Mississippi-Alabama Sea Grant obtained four separate grants to enhance community resilience. The grants (from the NOAA Regional Coastal Resilience Grant, NOAA Office for Coastal Management, NOAA Coastal Storms Program and Gulf of Mexico Alliance) are managed and led by a joint Mississippi-Alabama Sea Grant/Gulf of Mexico Alliance position. Four competitive funding opportunities were released for communities who had completed a self-assessment (the Coastal Community Resilience Index) and identified a gap that could be addressed with funding assistance. In addition, Mississippi led three separate climate adaptation competitions that selected a community implementation project addressing climate stressors.

Results:
A total of 20 small grants were awarded to communities across the Gulf of Mexico, and the communities have been integrated into the Gulf of Mexico Climate and Resilience Community of Practice. In addition, the communities committed $225,000 in matching funds making the total project implementation value over $1M. Communities addressed issues in several categories: stormwater management, Community Rating System and insurance, business continuity planning, sea-level rise and future flooding, protection of culturally significant sites from erosion, shoreline management/permitting/policy, infrastructure improvements and post-disaster recovery planning.

Recap:
Twenty coastal communities received funding to address vulnerabilities and implement on-the-ground projects to enhance their resilience.

Mississippi-Alabama Sea Grant leads effort to provide three communities with technical assistance in resilience planning

Relevance:
Local governments have cited the need for technical assistance for resilience planning to interpret information, provide science-based solutions and envision an enhanced future state of resilience.

Response:
After participation in a Coastal Community Resilience Index session facilitated by Mississippi-Alabama Sea Grant Consortium (MASGC) staff and MASGC-trained facilitators, the coastal communities of Fairhope (Alabama), Biloxi (Mississippi) and Terrebonne Parish (Louisiana) identified technical assistance needs. MASGC applied for and received a grant for $296,315 from the EPA Gulf of Mexico Program to create Expert Action Teams, which include local knowledge expertise and science expertise to solve a pressing problem in each of these communities. The MASGC-led effort released a Request for Resilient Action (RRA) that led to high-priority implementation projects in the three states.

Results:
The MASGC-led Expert Action Teams are assisting: (1) the City of Fairhope with a design charrette detailing options for achieving Clean and Resilient Marina status and improving stormwater runoff; (2) the City of Biloxi with creating uniform signage for living shoreline projects throughout the city and creating informational resources (written and online) to communicate with homeowners about living shoreline benefits; and (3) Terrebonne Parish with the development of plans for a floating grocery/supply store and the legal components associated with this type of infrastructure. As a result of this assistance, Fairhope has successfully addressed stormwater issues at a marina and received a Clean Vessel Act grant from the state of Alabama for the installation of pumpout stations at the site. Biloxi has approved signage for two living shorelines projects (Camp Wilkes and Old Brick House) along with consideration for an additional site (Popps Ferry Causeway). Terrebonne Parish is reviewing mock-up designs for the floating grocery store and enlisting grocery store experts to discuss stocking and restocking options.

Recap:
Mississippi-Alabama Sea Grant led a unique technical assistance effort that created multi-disciplinary Expert Action Teams in three local governments to increase their resilience to future coastal storms.

Northern Gulf of Mexico Sentinel Site Cooperative outreach efforts help integrate SLR science into coastal decision-making

Relevance:
Sea-level rise (SLR) is a critical hazard facing coastal ecosystems, communities and economies. Effective and efficient communication across the science-to-stewardship continuum is necessary for successful resilience. However, the science around SLR is expanding at a rapid pace. Local and regional planners and natural resource managers cannot keep up with the advancements in science.

Response:
The Northern Gulf of Mexico Sentinel Site Cooperative, a program supported by the Mississippi-Alabama Sea Grant Consortium, worked with researchers in the partnership to integrate new sea-level rise science into decision-making with natural resource management and coastal community planning. The cooperative has been socializing this new information across the northern Gulf participating in Tool Cafes, giving individual webinars, giving presentations at conferences, hosting workshops and spreading the word via various social media platforms and partner networks.

Results:
New SLR science is being integrated across a variety of sectors in the northern Gulf. For example, a recent marsh restoration design accounted for SLR utilizing the latest projections because of Northern Gulf of Mexico Sentinel Site Cooperative discussions and training efforts with local consultants. The Florida counties of Gulf, Franklin and Wakulla are using the updated SLR model on changing coastlines and storm surge due to SLR in place of previously used models as a direct result of the cooperative's workshops, private webinars and integration into the cooperative's network of experts.

Recap:
Efforts to socialize new SLR science has led to application in community planning and natural resource management.

Sea Grant saves communities money by leading activities credited through the Community Rating System

Relevance:
The Mississippi-Alabama Sea Grant Consortium (MASGC) facilitates workshops and trainings, delivers professional development credits and provides technical assistance to local communities looking to improve their Community Rating System (CRS) scores. These activities help communities earn points through the National Flood Insurance Program's CRS and reduce the flood insurance burden passed on to residents.

Response:
In 2014-2017, MASGC organized and led 30 training sessions focused on increasing knowledge about the CRS serving over 1,162 constituents. In addition, Sea Grant received funding to research the Program for Public Information (PPI), a newly implemented CRS activity. As a result, a comprehensive workshop was held to assist communities in Mississippi, Alabama and Louisiana with developing a PPI. MASGC provided direct technical assistance to the city of Biloxi to create and implement a PPI program, which will save the city money during their next CRS cycle visit (an evaluation to determine their flood insurance discount). Further, Sea Grant staff provide support and regular facilitation for the Coastal Hazard Outreach Strategy Team (CHOST), the CRS users group for coastal Mississippi. MASGC staff organize and participate in major outreach events for CHOST including annual mall outreach, The Home Product Show and presentations for target audiences, such as realtors, developers, contractors and insurance agents.

Results:
Sea Grant provided more than 224 professional certification hours in CRS-related topics, serving over 1,162 local constituents. In addition, Sea Grant's role in CRS activities saved seven local communities on average $24,271 in flood insurance premiums for a total of $679,600 from 2014-2017 ($169, 900 in savings per year). Through its direct involvement with CHOST, Sea Grant reached multiple communities and organized presentations and training sessions catered to the information needs of its local members. In addition, Sea Grant provided technical assistance to the City of Biloxi to implement the Program for Public Information, a new CRS requirement. Once adopted, the PPI will allow the city to maintain its class 5 CRS rating and provide additional insurance savings for residents.

Recap:
MASGC assisted seven local communities in saving $169,000 a year in reduced flood insurance premiums through its facilitation of the CHOST user group, technical assistance with the PPI and professional development trainings.

Research informs preservation of Native American sacred mound site, supports tribe's effort to become federally recognized

Relevance:
The Pointe-au-Chien Indian Tribe (PACIT) is seeking to become a federally recognized tribe. There are several steps required to obtain this status, and tribe members recognized that Traditional Ecological Knowledge (TEK) mapping could support their application for federal recognition.

Response:
The tribe gave oral history information and maps to a Mississippi-Alabama Sea Grant-supported research team. The research team also collected all known maps, photographs and other documents of the area dating as far back as the mid-1500s. Based on these resources and additional information from the tribe, the team created a single map showing where people used to live. The research team also gave the maps and data to the PACIT.

Results:
The research team translated and digitized old maps to show the movement of tribes over time and clarify some confusion that the federal recognition application review board had expressed. The team made more than 100 maps, a dedicated website and an online story-map (complete with a library of historical maps and local projections of sea-level rise and land loss) available to the tribe. Since the Sea Grant project concluded, the maps have been used in the designation process to preserve a Native American sacred mound. Researchers also received additional funding to address priorities identified during the Sea Grant-funded project.

Recap:
At the request of the Pointe-au-Chien Indian Tribe (PACIT), a Mississippi-Alabama Sea Grant-supported research team mapped historical tribal lands, which is aiding its application for federal recognition. The tribe also has used the maps in the process to preserve a Native American sacred mound.

Sea Grant builds bridge of trust with people who have questions about impacts of oil spills

Relevance:
A substantial amount of oil spill science information has been released since the 2010 Deepwater Horizon oil spill. People whose livelihoods depend on a healthy Gulf of Mexico may have trouble accessing and/or understanding the science published about the Deepwater Horizon oil spill, particularly if scientific language is too technical or study results appear contradictory.

Response:
The Sea Grant Oil Spill Science Outreach Program collects and translates peer-reviewed research for target audiences who rely on the Gulf for work or recreation. Through the life of the program, the team has built contacts around the region through one-on-one and large-group engagement with stakeholders. To examine the success of these efforts, Sea Grant partnered with NOAA's Office of Coastal Management to conduct two social network analyses of oil spill science information.

Results:
The NOAA/Sea Grant social network analysis revealed that the Sea Grant oil spill science outreach team members have played a prominent role in the oil spill science information social network to bridge communication between all target audiences. As they form relationships throughout the country, their influence spreads and new audiences seek them as a trusted resource. As a result, the oil spill response community involved team members in updating future spill response plans and industry leaders asked them to present emerging oil spill science at local, regional and national meetings.

Recap:
In less than four years, the Gulf of Mexico Sea Grant oil spill science outreach program has matured to become a trusted resource for current oil spill science, successfully engaging with the target audiences who seek them for credible oil spill information.

Research shows coastal residents are willing to pay to preserve open space associated with coastal waterfronts

Relevance:
Alabama. A contingent valuation method (CVM) was employed to estimate citizens' willingness to pay (WTP) to support open-space preservation. Waterfront open spaces are dynamic places and represent an interface between aquatic and terrestrial communities. Waterfront open space provides environmental benefits, recreational opportunities and opportunities for water-dependent economic activities (e.g., ports, boat yards, marinas, storage facilities, fishing docks, seafood markets and others). Benefits from waterfront open space are critical to coastal communities and their visitors. However, with a growing population and urbanization, these areas compete with various land use changes.

Response:
A Mississippi-Alabama Sea Grant Consortium-supported project evaluated residents' willingness to preserve open space (water permeable ground cover that is devoid of built structures and which may be public or private property) in coastal regions of Mississippi and Alabama. Two large and two small communities were selected based on total population: Daphne and Mobile, Alabama, and Biloxi and Ocean Springs, Mississippi.

Results:
Study findings suggested the majority of residents valued waterfront preservation. More than 70 percent of respondents supported the preservation of open space, of which 50.54 percent were willing to make a one-time payment of at least $80. Median willingness to pay was more than $80 and less than $162.14 as a one-time payment in all four models tested in the study. This suggests that the majority of respondents valued waterfront open-space preservation. Local planners and decision-makers will benefit from these findings, which demonstrate a quantitative evidence of the value of open space among their constituents. The data provided the foundation to implement outreach programs to convey the importance of open space preservation to decision makers in their community planning decisions.

Recap:
Research suggests that more than 70 percent of coastal residents would be willing to preserve waterfront open space with a willingness to pay $80-$162 to preserve these areas.

Mississippi-Alabama Sea Grant serves as leader for Alabama Working Waterfront Initiative

Relevance:
In Alabama's coastal zone, real estate values are escalating and competition for land use is increasing. As tourism development and population growth drive property values higher, locally owned working waterfront businesses are disappearing. Investments in alternative land uses after natural and human-caused disasters also have caused conversion of traditional waterfront uses.

Response:
The Mississippi-Alabama Sea Grant Consortium supported and led the Alabama Working Waterfront Coalition as it elected officers, created a board of directors, adopted by-laws and used information from Mississippi-Alabama Sea Grant's Legal Program to file articles of incorporation with the state of Alabama. After years as an ad hoc committee, the stakeholder group was able to operate as an independent entity. Coalition members from a wide range of water-related economic sectors were able to speak with one voice in larger political and economic-development forums.

To improve its visibility, the coalition developed and implemented a Sea Grant-funded marketing plan. Mississippi-Alabama Sea Grant also successfully competed for funding from the National Sea Grant Law Center to develop two websites: "Accessing the Alabama Coast" and "Accessing the Mississippi Coast," which contained information on coastal access options.

Results:
Numerous Sea Grant efforts led the development of the Alabama Working Waterfront Coalition and ultimately to the Alabama Legislature recognizing the importance of working waterfronts. The Legislature created the Alabama Waterfront Access Study Committee, which Mississippi-Alabama Sea Grant facilitated. The committee studied issues related to working access to Alabama's waterways. Its final report included recommendations regarding planning/zoning, financial incentives, and socio-economic and infrastructure issues.

On the national level, Mississippi-Alabama Sea Grant was selected by the National Working Waterfronts Network to co-host the 4th National Working Waterfronts & Waterways Symposium. More than 200 participants from 24 states and Canada increased their capacity to address working waterfront issues in their communities.

The Alabama Working Waterfront Coalition's branding efforts led to broader recognition and outreach opportunities. On social media, the coalition has nearly 400 Twitter followers and more than 200 Facebook followers.

Recap:
The importance of working waterfronts in Alabama is better recognized at a local, state and national levels, and stakeholders are better informed of working waterfront issues.

Sea Grant saves communities money by leading activities credited through the Community Rating System

Relevance:
The Mississippi-Alabama Sea Grant Consortium (MASGC) facilitates workshops and trainings, delivers professional development credits and provides technical assistance to local communities looking to improve their Community Rating System (CRS) scores. These activities help communities earn points through the National Flood Insurance Program's CRS and reduce the flood insurance burden passed on to residents.

Response:
In 2014-2017, MASGC organized and led 30 training sessions focused on increasing knowledge about the CRS serving over 1,162 constituents. In addition, Sea Grant received funding to research the Program for Public Information (PPI), a newly implemented CRS activity. As a result, a comprehensive workshop was held to assist communities in Mississippi, Alabama and Louisiana with developing a PPI. MASGC provided direct technical assistance to the city of Biloxi to create and implement a PPI program, which will save the city money during their next CRS cycle visit (an evaluation to determine their flood insurance discount). Further, Sea Grant staff provide support and regular facilitation for the Coastal Hazard Outreach Strategy Team (CHOST), the CRS users group for coastal Mississippi. MASGC staff organize and participate in major outreach events for CHOST including annual mall outreach, The Home Product Show and presentations for target audiences, such as realtors, developers, contractors and insurance agents.

Results:
Sea Grant provided more than 224 professional certification hours in CRS-related topics, serving over 1,162 local constituents. In addition, Sea Grant's role in CRS activities saved seven local communities on average $24,271 in flood insurance premiums for a total of $679,600 from 2014-2017 ($169, 900 in savings per year). Through its direct involvement with CHOST, Sea Grant reached multiple communities and organized presentations and training sessions catered to the information needs of its local members. In addition, Sea Grant provided technical assistance to the City of Biloxi to implement the Program for Public Information, a new CRS requirement. Once adopted, the PPI will allow the city to maintain its class 5 CRS rating and provide additional insurance savings for residents.

Recap:
MASGC assisted seven local communities in saving $169,000 a year in reduced flood insurance premiums through its facilitation of the CHOST user group, technical assistance with the PPI and professional development trainings.

FORTIFIED Home™ demonstration projects result in 11 local jurisdictions adopting "code plus" policies

Relevance:
Coastal homes are vulnerable to a wide array of hazards, and while local communities have adopted modern building codes to improve their resilience, the codes contain minimum standards. As technology and engineering advances occur, there are opportunities to build "code plus," or beyond standard building codes. "Code plus" is based on the FORTIFIED Home™ Program and provides increased strength and resilience to ensure homeowners have a house to come home to after a storm.

Response:
Mississippi-Alabama Sea Grant Consortium, in partnership with Smart Home America and local communities, supported three Alabama demonstration projects that allowed homeowners, builders and community leaders to see "code plus" building. The first home included retrofitting that raised awareness for building "code plus." The second demonstration home highlighted the advantages and cost-effectiveness of concrete construction. The third demonstration home demonstrated the need for enhanced roofing construction codes. This home included the replacement of a tornado-damaged roof to "code plus" FORTIFIED standards.

Results:
A partnership among the project leaders (Mississippi-Alabama Sea Grant, the insurance industry, Smart Home America and Habitat for Humanity) allowed homeowners, community leaders, local officials and builders to view "code plus" building practices in action. It also allowed local stakeholders to learn more about the advantages and cost benefits of "code plus" building. In addition, 30 college students were trained in the "code plus" construction standard through a partnership with Collegiate Build. Finally, 11 local jurisdictions incorporated the "code plus" standard into their building ordinances through policy creation and adoption. The future savings due to risk reduction and decreased insurance premiums at the three demonstration sites totals more than $210,000 and had a total $45,000 cost, which results in a 366-percent return on investment.

Recap:
Three FORTIFIED Home™ demonstration projects in Alabama increased awareness of the benefits of building to "code plus," which resulted in 11 local jurisdictions adopting "code plus" policies. The demonstration projects' economic return on investment is estimated at 366 percent.

Community Resilience Index improves preparedness of coastal municipalities in Mississippi and Alabama; transfers model to other parts of U.S. and beyond

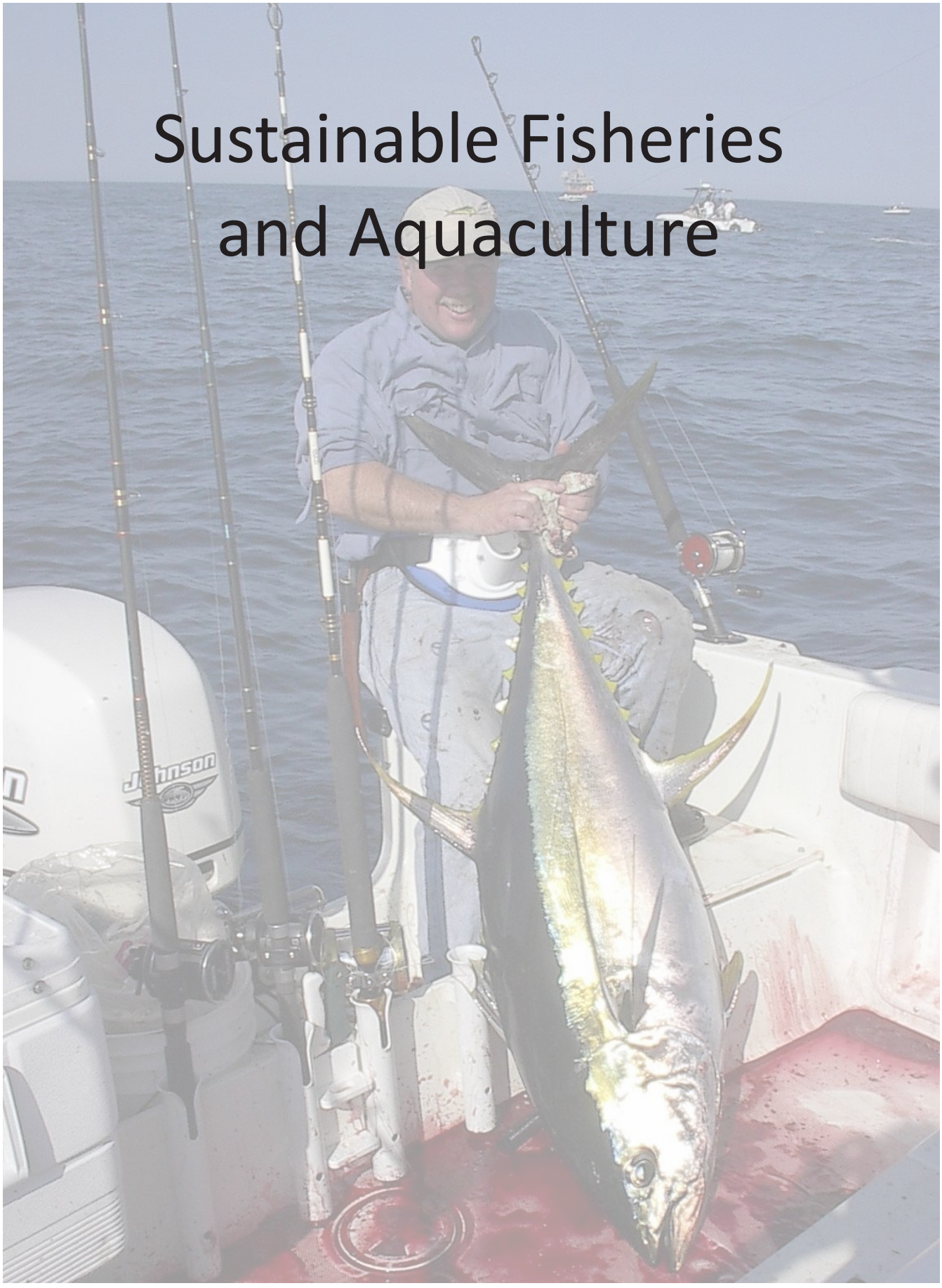
Relevance:
As the Gulf Coast population increases, so does the risk of exposure to floods, hurricanes and other storm-related events. Coastal managers and decision-makers want to increase their communities' capacity to bounce back from stressors and reduce immediate impacts and long-term economic losses. Communities, however, lack the baseline data needed to measure resilience.

Response:
The Mississippi-Alabama Sea Grant Consortium (MASGC) and MASGC-trained volunteers facilitated the use of the Coastal Community Resilience Index (CRI) in 55 coastal communities across the Gulf region. The self-assessment tool allows communities to use existing knowledge, data and studies to examine resilience in terms of critical infrastructure, community plans and agreements, mitigation measures and other factors. It identifies problems communities should address and where they should allocate resources. MASGC trained 117 facilitators in the Gulf of Mexico, New England, Pacific Islands, Mexico and Bangladesh prior to 2014 and another 109 facilitators between 2014-2017. In addition, three sector indices were created (Tourism, Fisheries, Ports) and pilot tested to address resilience planning for important businesses that serve as economic drivers for coastal communities in Mississippi and Alabama. MASGC has assisted six additional states (Wisconsin, Maine, New York, Massachusetts, Minnesota, Hawaii) with the development of their own versions of one or more of the indices, as well as transferred the concept to three countries (Macedonia, Bangladesh and Mexico). Finally, MASGC has modified the CRI for use in the high school classroom through a NOAA BWET grant in partnership with The University of Southern Mississippi and the Pascagoula and Gautier (Mississippi) School Districts, reaching 246 students.

Results:
At least 15 municipalities have taken action to improve resilience to natural hazards. Foley (Alabama) has taken steps to join the Community Rating System and reports better hazard planning communication among city offices. Perdido Beach (Alabama) updated its Comprehensive Plan to include periodic reviews of the CRI to assess progress toward resilience, and the town is developed a communications plan to encourage citizens to participate in resilience planning efforts. Biloxi (Mississippi) formed better emergency plans and network connections with CSX, whose railroad bisects the city, potentially causing issues in times of emergency. Fairhope (Alabama) applied for and received three different grants to address gaps such as stormwater management, marina resilience, and community visioning. A total of 226 people have been trained as facilitators of the CRI, 246 high school students have completed projects on the CRI, and six states have used at least one of the indices as a model for work in their regions.

Recap:
After completing the Coastal Community Resilience Index, a self-assessment tool, at least 15 municipalities and 246 students across the Gulf of Mexico region increased their resilience to natural hazards.

Sustainable Fisheries and Aquaculture



Trade Adjustment Assistance training leads to more than $3M in direct payments to Alabama, Mississippi shrimpers

Relevance:
Producers in the U.S. shrimp industry have experienced economic hardships because of rising production costs and competition from imported shrimp. This hardship forced many shrimpers to leave the industry. In order for the domestic fishery to remain viable, producers needed to learn how to reduce operating costs and get more money for their catch. In 2010, the Southern Shrimp Alliance successfully petitioned for shrimp harvested in the Gulf of Mexico and South Atlantic (North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas) to be considered an eligible commodity for the Trade Adjustment Assistance (TAA) for Farmers program in FY2010. Nearly 4,000 members of the shrimping industry from throughout the eight states applied to participate in the FY2010 TAA program.

Response:
Before becoming eligible for cash benefits, each producer needed to receive 12 hours of TAA Intensive Technical Assistance and develop an initial business plan to help them become more competitive in the world marketplace. In 2011, 22 3-hour TAA workshops were conducted on topics designed to increase the global competitiveness and economic levels of Gulf and South Atlantic shrimpers. Mississippi-Alabama Sea Grant outreach personnel developed training modules, helped industry members fill out forms and paperwork, and assisted with workshop advertisement, logistics and facilitation. More than 750 commercial fishermen from Alabama and Mississippi participated in the TAA workshops.

Results:
In Alabama and Mississippi, 789 shrimpers each received 12 hours of Intensive Technical Assistance under the Trade Adjustment Assistance Program for Shrimpers, making each eligible for $4,000 in cash benefits. This totaled $3,156,000 in additional earnings for shrimpers.

Recap:
Because of Mississippi-Alabama Sea Grant Consortium outreach efforts, shrimpers obtained training that made them eligible for more than $3 million in cash benefits under the U.S. Department of Agriculture Trade Adjustment Assistance Program (www.taaforfarmers.org).

Scientists develop experimental design for red snapper absolute abundance estimate

Relevance:
The red snapper is the most economically important finfish in the Gulf of Mexico and a popular target of the sport fishing and commercial fishing industries throughout the Gulf. Historical overharvesting resulted in an overfished red snapper population. Under current federal and state management measures, the population is rapidly recovering, with full recovery expected by 2032. There is some disagreement among resource managers, fishermen and environmental groups surrounding the 2014 and earlier stock assessments for red snapper. Much of the disagreement centers on the accuracy of estimating the red snapper population around oil and gas platforms, artificial reefs and other structures considered to be difficult to sample using traditional sampling methods.

Response:
To reduce the uncertainty among different fishing sectors and resource managers, a two-phase competitive research grants program is underway. Phase I led to a valid and reliable experimental design to use in a large-scale study using tagging and advanced technologies, such as remotely operated vehicles and camera arrays to survey large expanses of the Gulf. Six projects were funded to develop the experimental design.

Results:
An expert review panel worked to refine the best aspects of these designs into a single request for proposals. A final team of the world's top red snapper researchers was selected to use the experimental design developed in Phase I to conduct a one-time estimate of absolute abundance of red snapper in the Gulf of Mexico. This design will use the best scientific methods available, including advanced technology and traditional mark-recapture methods. The $12.5 million red snapper research program is unprecedented in scale and level of engagement with university scientists, resource managers and the fishing industry. The red snapper abundance estimate will be considered an independent Gulf-wide estimate and will be compared with NOAA Fisheries' red snapper stock assessment.

Recap:
The Mississippi-Alabama Sea Grant Consortium led the development of a red snapper experimental design to estimate reef fish abundance in a large marine ecosystem.

Sea Grant-supported research allows U.S.-based aquaculture feed manufacturers to use enhanced dietary supplement, be competitive in global market

Relevance:
Taurine is a nutrient required in the diet of many fish species. In aquaculture, taurine has traditionally been supplied to fish via fishmeal, but scrutiny over the sustainability of fishmeal as a major source of protein has pushed researchers and industry toward using alternative protein sources, such as plants. However, plants contain no taurine, and feeds using high levels of plant protein must be supplemented with taurine to avoid a deficiency detrimental to the growth and health of fish. Because taurine was not approved for use in fish feeds in the United States, feed manufacturers were forced to use higher levels of fishmeal, which resulted in higher prices and is widely recognized as unsustainable. Additionally, U.S. feed manufacturers are penalized on the international feed market because taurine is approved everywhere else in the world.

Response:
Mississippi-Alabama Sea Grant-supported researchers examined information on the efficacy and safety of crystalline taurine used in fish feeds and conducted research to fill knowledge gaps. The information was compiled in a final document, which was submitted to the U.S. Food and Drug Administration (FDA) and the Association of American Feed Control Officials (AAFCO) to amend the current taurine definition and include fish as approved species.

Results:
The FDA and the AAFCO approved the use of crystalline taurine. As of January 18, 2017, U.S. feed manufacturers could include crystalline taurine in their formulations. The use of taurine allowed them to further reduce fishmeal and other animal proteins to reduce cost and improve sustainability of their feeds and to better compete with other manufacturers. There is an increased use of the dietary supplement following its approval and the expansion of awareness of the efficacy of taurine in marine fish feeds. It is now a standard supplement for production diets for marine species, such as Seriola, and is commonly included in maturation diets for marine species. In fact, almost all of the live food enrichment products in the United States now contain taurine. Due to the researchers' success they have secured additional funding from private industry to advance understanding and use of taurine in fish feed.

Recap:
Because of MASGC-supported research, U.S. aquaculture feed manufacturers produce improved, widely used fish feeds that are effective, more sustainable, less expensive to produce, and more competitive on the international market.

Taurine supplementation increases yellowtail reproductive output for aquaculture

Relevance:
Production of healthy juveniles is a common bottleneck in many marine fish hatcheries. Reduced number of spawned eggs, low fertilization and/or hatching rates, and high mortality during the larval stages are major drivers in the production output of a hatchery. There can be no successful commercial culture without a consistent, high-quality hatchery production for a given species. California yellowtail has been touted as a promising aquaculture candidate – yet hatchery production remains variable, hence risky. Taurine has been identified as a critical nutrient in juvenile and larval stages, and Mississippi-Alabama Sea Grant-supported researchers hypothesized that taurine also was important in broodstock for reproductive output.

Response:
Scientists fed California broodstock a taurine-supplemented or unsupplemented diet. The resulting larvae were cultured with or without dietary taurine supplementation.

Results:
Broodstock receiving taurine supplementation had an increased number of eggs spawned. Because other metrics remained unchanged, this resulted in a net increase in viable egg production. Very high to complete mortality were seen in larvae originating from the unsupplemented broodstock group. In larvae coming from the supplemented broodstock, taurine supplementation had little effect.

Recap:
Researchers improved the production of viable California yellowtail eggs for aquaculture through an enhanced broodstock diet that included taurine.

Scientists develop field-applicable vibrio detection kit for oysters; company pays for rights to use it

Relevance:
Despite *V. parahaemolyticus* management plans and industry efforts, illness rates continue to go up indicating that industry and regulators have been unable to manage the problem. The oyster industry needs rapid, easy-to-use test kits to detect *V. parahaemolyticus* levels to evaluate seafood safety when oysters are removed from the water. The tool could be used to evaluate re-submersion following anti-biofouling and other aquaculture practices that state and federal regulators may find likely to increase the risk of vibrio illness.

Response:
Mississippi-Alabama Sea Grant-funded scientists developed a simple, rapid and low-cost (compared to other accepted methods) Vp assay kit that will expand industry capacity to develop new post-harvest processing approaches, such as high-salinity relaying or depuration.

Results:
These tests provide a simple, rapid (18 hour) result for total and potentially pathogenic V*. parahaemolyticus* levels in oysters. Initial testing demonstrated 100-percent specificity against 48 *V. parahaemolyticus* and 26 non-Vp and sensitivity of less than 10 cells/test. Using the 96-well plate format, comparability testing demonstrated excellent reliability of these test kits, with 183 naturally-incurred oyster samples from the Gulf, Atlantic and Pacific coasts tested and good agreement ($P < 0.05$) was observed between the test kit for total *V. parahaemolyticus* and Most Probable Number real-time Polymerase Chain Reaction. Secure Food Solutions, Inc. has exercised an option to adopt this new technology for use in the United States.

Recap:
Scientists create a rapid, easy-to-use and cost-effective assay kit to detect *V. parahaemolyticus* in oyster samples. A food safety diagnostics company has paid for the rights to use the kit.

Integrated program expands oyster farming industry in Alabama

Relevance:
The Gulf Coast oyster industry has suffered a number of setbacks, both natural and manmade, that are challenging an industry built around inexpensive, plentiful oysters. Off-bottom oyster farming for the high-value, half-shell niche market provides an opportunity for Gulf residents to create jobs, provide high-quality oysters for the marketplace and improve the environment.

Response:
Between 2010 and 2018 Sea Grant-funded scientists, extension staff and legal staff created an integrated program using translational research and outreach programs on production methods and best management practices. Their work led to the creation of a new oyster farming industry in Alabama.

Results:
Based on a situation and outlook survey of 2016 farms, nine of 13 permitted farms reported 18.1 acres of production with total annual sales of almost $2 million. More than 2.8 million oysters were produced on 18.1 acres. The nine farms who responded to the survey employed 20 full-time employees and 10 part-time employees. In 2017, there were 15 permitted farms. The oyster farming industry was non-existent prior to 2010.

Recap:
Mississippi-Alabama Sea Grant-funded programing led to the creation of an Alabama oyster farming industry that is valued at more than $2M per year and employs more than 30 people.

Research quantifies value of ecosystem services of off-bottom oyster farms in the Gulf of Mexico

Relevance:
Documentation of the economic value of ecosystem services of off-bottom oyster farming provides a better understanding of the public benefits of leasing public grounds and waters for private use, increasing public acceptance and allowing regulatory agencies to consider reduction of permit fees to a rate that encourages applications and oyster farm start-ups.

Response: Sea Grant-funded researchers conducted an exhaustive search of the scientific literature to quantify ecosystem services provided by oyster farming or generate reasonable estimates of ecosystem services from oyster reefs. With these data, Sea Grant-funded researchers performed an economic analysis on two oyster farms in Alabama and Louisiana to estimate the economic value of the ecosystem services provided by off-bottom oyster farming in these areas.

Results:
The marginal economic value per acre of off-bottom long-line aquaculture in terms of recreational and commercial fisheries enhancements was estimated at $1,564 in Alabama and $2,286 in Louisiana. Using the low end of the marginal economic values, the 18 acres of oyster farms in Alabama provides more than $28,152 beyond the $2M in (2016) commercial sales. Scientists presented the results of this work at a meeting of Alabama oyster growers, a meeting of the National Shellfisheries Association and various invited presentations to regional groups. The results were also shared in the electronic newsletter for Alabama and Mississippi oyster farming (“On the Lid”) with over 100 subscribers, and on social media outlets for Auburn University Shellfish Laboratory (e.g., Facebook, Twitter and Instagram). Ecosystem services were explicitly included in the Gulf of Mexico Shellfish Initiative, drafted by the Gulf Oyster Industry Council. The initiative calls for an ecosystem service approach to drive oyster management. Scientists also shared these results with the Mississippi Department of Marine Resources and the North Florida Aquaculture Association in their efforts to permit off-bottom oyster farms in Mississippi and Florida.

Recap:
Ecosystem services research finds that Alabama oyster farms provide almost $30,000 in ecosystem services beyond the value of commercial sales. This research is influencing how permitting decisions are made, and oyster growers are using it as a marketing tool.

Oyster farming parks, legal specialists play integral roles in creating Alabama oyster farming industry

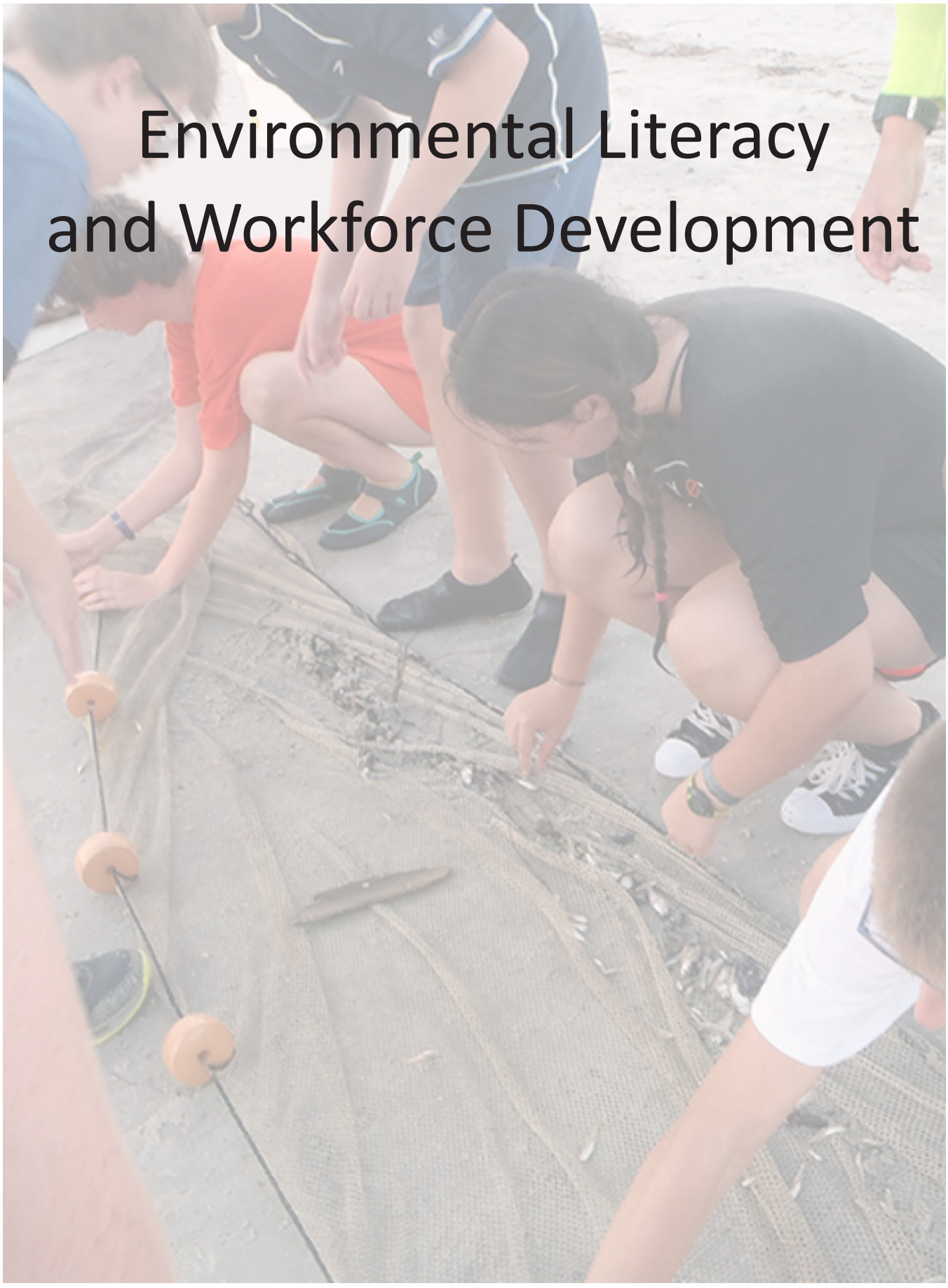
Relevance:
The Gulf Coast oyster industry has suffered a number of setbacks, both natural and manmade, that are challenging an industry built around inexpensive, plentiful oysters. Off-bottom oyster farming for the high-value, half-shell niche market, as practiced on the northeast and Pacific coasts, provides an opportunity for Gulf residents to create jobs, increase profits and diversify the oyster industry.

Response:
Sea Grant-funded scientists established two large oyster farming parks that serve as platforms for training and business development. They are part of a partnership between Louisiana Sea Grant, the Mississippi-Alabama Sea Grant Consortium, Auburn University and Louisiana State University. The parks demonstrate grow-out and harvesting technology and techniques. Scientists also provide technical advice and evaluations of possible farm sites to potential oyster farmers. Along with scientists, Sea Grant legal specialists were integral in providing research to inform passage of state legislation that clarified and simplified the permitting process.

Results:
In partnership with Organized Seafood Association of Alabama (OSAA), a Sea Grant-funded extension specialist created an oyster farming park in south Mobile County. Mississippi-Alabama Sea Grant supported the hands-on training program called Oyster Farming Fundamentals. To date 32, adult students that have collectively raised 520,000 oyster seed. A “vo-tech” program for Alma Bryant High School students also uses the oyster farming park. Of these, at least 12 have gone on to start their own commercial oyster operation or work with another commercial farmer. This program has been used as a model in both Mississippi (20 participants in 2018) and Wakulla County, Florida (with over 75 participants to date).

Recap:
Mississippi-Alabama Sea Grant legal research and outreach through Auburn University established an oyster farming park as a training area for new oyster farmers, which led to the development of the commercial off-bottom oyster farming industry in Alabama.

Environmental Literacy and Workforce Development



More than 70,000 P-12 students increase environmental literacy, understanding of healthy coastal ecosystems, fisheries and resilience through place-based hands-on education programs

Relevance:
Sea Grant's goals include an environmentally literate public. Field-based hands-on education programs can increase environmental literacy as well as science, technology, engineering and math (STEM) literacy through direct experiences in coastal environments. These field experiences increase student understanding of how coastal habitats and scientific research enhance quality of life, promote sustainability of coastal resources and help individuals make responsible decisions concerning coastal resources.

Response:
During 2014-2017, field-based hands-on learning experiences at three Mississippi-Alabama Sea Grant-supported environmental centers in Mississippi and Alabama enabled more than 70,000 students to develop a personal understanding of and relationship to coastal habitats (e.g., estuaries, wetlands, forests, barrier islands), their resident organisms and critical ecological processes. These experiential learning programs addressed specific science, ocean and climate literacy concepts while developing science, technology, engineering and math skills through authentic methods of data collection. They were developed with explicit reference to national and state educational standards.

Results:
Dauphin Island Sea Lab's Discovery Hall Programs academic year sessions, Mobile County Public School System's Environmental Studies Center Project SEA ICE (Special Enrichment Activities in Coastal Ecology) and University of Southern Mississippi's Gulf Coast Research Lab's Marine Education Center's Coastal Sciences Camps and Miss Peetsy-B Bayou Tours resulted in more than 70,000 P-12 students actively engaged in field experiences of varying length (1-4 hrs) aboard boats, in salt marshes, at beaches, in forests, in other coastal habitats or with coastal organisms. Pre- and post-test assessments indicated significant improvement in student content knowledge at all three environmental education center locations with statistically significant content knowledge gains ranging from 17 percent to 37 percent in more than 3,500 students.

Recap:
During the period 2014-2017, more than 70,000 P-12 students increased their environmental literacy and understanding of healthy coastal ecosystems, fisheries and resilience. They improved their STEM skills by participating in experiential field-based education experiences through Mississippi-Alabama Sea Grant Consortium-supported programs at Discovery Hall Programs (Dauphin Island Sea Lab), the Environmental Studies Center (Mobile County Public School System) and the Marine Education Center (Gulf Coast Research Laboratory).

P-12 teachers increase environmental and Gulf of Mexico literacy, STEM skills through professional development programs

Relevance:
Professional learning opportunities and firsthand experience increase teachers' and informal educators' knowledge and comfort level on coastal, ocean and environmental topics and are efficient ways to disseminate new and relevant research results. Educators who are more knowledgeable about the Gulf of Mexico and its coastal environments will share that knowledge with their students leading to an increase in environmental literacy and the inculcation of a feeling of stewardship for the coastal region.

Response:
During the period 2014-2017, Mississippi-Alabama Sea Grant Consortium (MASGC) supported workshops at three MASGC-supported environmental centers in Mississippi and Alabama for teachers and informal educators that addressed topics related to healthy coastal ecosystems, fisheries and coastal resilience. Specific topics included the Deepwater Horizon oil spill, Gulf of Mexico watersheds, oysters, bees, climate change, fisheries and fisheries management, aquaculture, healthy coastal ecosystems, habitat restoration, marine debris and microplastics, the solar eclipse, conservation and ocean exploration. Additionally, MASGC-supported educators provided field experiences for teachers and educators at the three environmental education learning centers and shared knowledge, experiences and activities at national, regional and state education conferences.

Results:
MASGC-supported workshops and programs at Dauphin Island Sea Lab's Discovery Hall Programs, Mobile County Public School System's Environmental Studies Center and University of Southern Mississippi's Gulf Coast Research Lab's Marine Education Center provided approximately 1,500 educators with professional learning opportunities and field experiences. Single day and multi-day workshops increased content knowledge, provided direct hands-on experiences in coastal environments and increased confidence with relevant hands-on classroom activities among participants. Assessments and post-workshop evaluations demonstrated increased content knowledge among participants and indicated that more than 90 percent of participants felt that workshop activities were valuable or very valuable. Funding from MASGC enabled educators to attend at little or no cost.

Recap:
During the period 2014-2018, approximately 1,500 educators increased their environmental literacy and knowledge of healthy coastal ecosystems, fisheries and coastal resilience through Mississippi-Alabama Sea Grant-supported field experiences, workshops and educational programs at Discovery Hall Programs (Dauphin Island Sea Lab), the Environmental Studies Center (Mobile County Public School System) and the Marine Education Center (Gulf Coast Research Laboratory).

Mississippi-Alabama Sea Grant supports graduate students, develops workforce

Relevance:
Graduate education is a significant component of Mississippi-Alabama Sea Grant Consortium's annual budget. Graduates go on to land jobs in such places as academia, industry and environmental non-profit organizations.

Response:
During the 2014-2017 reporting period, 4.5 Ph.D. degrees, 8.5 master's degrees and 2 Juris Doctorate degrees were awarded to Mississippi-Alabama Sea Grant-supported students. Based on literature values, the value of a master's degree is valued $584,881, and a Ph.D. is valued at $1,315,982 over the course of a 30-year career.

Results:
The one-time economic impact of Mississippi-Alabama Sea Grant-supported graduate education for 2014-17 was more than $12M based on a 30-year career.

Recap
Mississippi-Alabama Sea Grant's support for graduate education is valued at $12M.

Mississippi-Alabama Sea Grant demonstrates leadership in addressing regional issues, implements projects totaling $15.8M

Relevance:
Throughout the Gulf of Mexico, coastal communities are exposed to similar risks and issues of concern, including hurricane threats, loss of habitats and ecosystem services, impacts of coastal development, risks associated with extraction of natural resources, and more.

Response:
The Mississippi-Alabama Sea Grant Consortium (MASGC) was the leader of many regional projects involving Sea Grant programs in the Gulf of Mexico. These projects included a regional research planning initiative, a NOAA community-based restoration program, a privately funded oil spill science outreach program, a NOAA sentinel site program, a National Water Extension Liaison, an independent stock assessment of red snapper research competition, and a NOAA Coastal Storms program. Through leveraging work with the three other Gulf Sea Grant programs, the impacts of these efforts were far-reaching and often renewed for continued funding.

Results:
In 2014-17, Mississippi-Alabama Sea Grant supported 20 regional projects through management of $15.8M in regional funding. These regional partnerships have been so successful that some of the efforts, such as the national water extension liaison program, StormSmart Coast network, red snapper stock assessment initiative and Climate and Resilience Community of Practice, are broadening to have national impacts. The Gulf of Mexico Climate and Resilience Community of Practice is being emulated around the country, and the oil spill science outreach program now includes a national scope.

Recap: (no more than 500 characters)
The Mississippi-Alabama Sea Grant Consortium is a regional and national leader in multi-state, multi-region strategic initiatives, managing $15.8M in projects covering a broad range of topics related to fisheries, oil spills, hurricanes, flooding, waterways and restoration.

Cross-cutting

Emergency responders use information synthesized by Sea Grant oil spill team to protect society, environment

Relevance:
Emergency responders are required to complete training courses throughout their careers and regularly attend Regional Response Team and Area Committee meetings to stay informed about local, regional and national spill response issues and best practices. Post-Deepwater Horizon oil spill, the emergency response community needed to incorporate current, relevant and synthesized science information into response education, training and planning activities. The NOAA Office of Response and Restoration, the U.S. Coast Guard and the National Spill Control School invited the Sea Grant oil spill science outreach program to address this need.

Response:
The Sea Grant-led outreach program synthesized science to develop oil spill science publications, seminars and trainings specifically for emergency responders. The National Spill Control School at Texas A&M University trains approximately 400 students annually, including courses for academic credit and individuals from industries and government agencies. The school adopted the Sea Grant oil spill science program's publications as a training tool. NOAA's Science of Spills courses help emergency responders increase their understanding of spill science when analyzing spills and making risk-based decisions. The Sea Grant program presented new science to Science of Spills' trainees. Sea Grant specialists also participated in Regional Response Team and Area Committee meetings to update Area Contingency Plans and present new science.

Results:
Nationally, regionally and locally, the emergency response community is incorporating the Sea Grant Oil Spill Science Outreach Program's synthesized information into activities and trainings.

Recap:
Multiple agencies and industries are using oil spill science extension information to make informed decisions.

Mississippi-Alabama Sea Grant leadership prompts volunteers to give more than $1.2M worth of time, effort and expertise to coastal issues

Relevance:
Coastal residents across Mississippi and Alabama seek opportunities to learn more about and enhance the bays, bayous and beaches throughout the region. Often they do not know where they can serve. Meanwhile, large-scale programs such as oyster gardening, beach cleanups, coastal research projects and similar programs do not have enough staffing to complete the needed work.

Response:
Mississippi-Alabama Sea Grant created programs and/or led long-standing programs that provided opportunities for volunteers to contribute their time, effort and expertise to enhance coastal areas. These programs include Mobile Bay Oyster Gardening Program, Mississippi Coastal Cleanup, Mississippi Master Naturalist Program, a variety of education programs and research-related projects.

Results:
Between 2014 and 2017, thousands of people participated in Mississippi-Alabama Sea Grant-led volunteer activities and programs. These volunteers contributed more than 64,000 hours valued at $1.22M, based on a $19 value of an hour of volunteer time.

Recap:
Mississippi-Alabama Sea Grant provided volunteer opportunities to coastal residents, and their contributions were valued at more than $1.22M.

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