UF | IFAS Research
UNIVERSITY of FLORIDA

COASTAL RESILIENCE

NATURAL RESOURCES

AGRICULTURE

HUMAN SYSTEMS

Florida has more coastline than any other state in the contiguous U.S., totaling approximately 1,350 miles. Much of the state's land mass is a peninsula, and all Florida residents live within 80 miles of the shore. Three-fourths of these residents — about 15 million people — live in coastal counties.

Many people choose to live near the shore for the lifestyle that it offers. However, the close proximity of the sea also means that coastal communities and ecosystems are subjected to powerful natural forces, notably hurricanes and beach erosion. In recent decades, human activity has impacted the marine environment and new challenges have followed, including coral-reef damage, harmful algae blooms, and saltwater intrusion into potable water that we obtain from aquifers.

At the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS), researchers are finding innovative methods of assessing and addressing these challenges to enhance the resiliency of both human communities and natural environments. These scientists have a long-term commitment to help Florida's coastlines remain livable and sustainable for residents and visitors, and to serve as an example worldwide.

Ongoing Research

SALTWATER INTRUSION

Seawater intrusion into coastal aquifers disrupts freshwater supplies to communities and is becoming more common due to rising sea levels and declines in groundwater. In June 2012, Cedar Key, Fla. was impacted by a saltwater intrusion event that left local citizens without drinking water for two weeks while new water-treatment plans were developed and implemented. Bill Pine, UF/IFAS Department of Wildlife Ecology and Conservation associate professor, was part of a team that analyzed the event to document treatment options, costs, and tradeoffs. The information is available for coastal communities to use in decision making when faced with a similar challenge. The team is now determining how changes in freshwater availability affected local resources, including the shellfish industry, and how to minimize those impacts in future saltwater intrusion events.

SEA OAT OUTPLANTING

Sea oats, *Uniola paniculata*, are iconic and environmentally crucial coastal plants that help stabilize dunes and prevent erosion. UF/IFAS professor Deborah Miller, at the UF/IFAS West Florida Research and Education Center in Milton, Fla., and her team replanted plots of sea oats on the barrier island dunes with a 10-cm covering of wheat-straw mulch to mimic the natural "litter" found seaside. After six months, mulched plants had four times the aboveground biomass compared to unmulched control plants. These results provide coastal communities with a cost-effective option for improving the beach environment to facilitate the establishment of sea oats that protect coastal infrastructure. Miller's team plans to test this technique on an operational scale and determine if it can help the establishment and growth of other coastal plant species.

CORAL RESTORATION

To repopulate and restore damaged coral reefs, scientists are turning to aquaculture, or farming of aquatic organisms. To efficiently generate a more diverse and resilient coral population, Joshua Patterson, an assistant professor stationed at The Florida Aquarium's Center for Conservation in Apollo Beach, Fla., leads a team researching the spawning habits of endangered staghorn coral, *Acropora cervicornis*. Corals cultured in a nursery operated by the Coral Restoration Foundation produce eggs and sperm that are released into reef waters during specific lunar phases. Team members collected this material, facilitated egg fertilization, and then identified artificial surface types that attracted the most free-swimming juveniles as they sought a permanent home. The findings will be used by aquaculture specialists as they implement coral restoration programs that will accelerate regeneration of these endangered coral species.

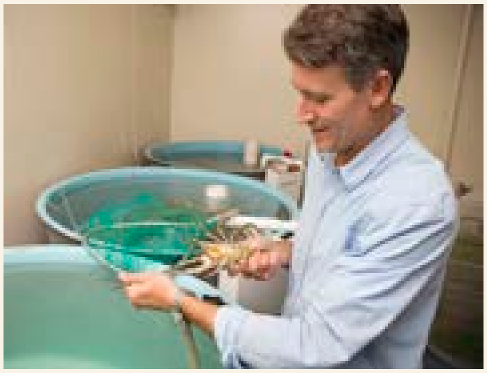
Research with Impact

COASTAL COMMUNITY RESILIENCE

The 2010 collapse of the Deepwater Horizon offshore oil rig did little visible environmental damage to Florida's Gulf Coast, but the event still curtailed tourism and impacted businesses. To help Panhandle communities prepare for similar events, a research team evaluated response efforts by governmental agencies and non-profit organizations. The team, led by Angela Lindsey, an assistant professor with the UF/IFAS Family, Youth and Community Sciences Department, determined that a well-coordinated and speedy communication effort could have reassured residents and vacationers by providing much-needed local information about the oil slick's position and movement. These findings enabled Lindsey to help several communities form disaster-response teams that developed plans for addressing critical needs quickly, and allowed her the opportunity to network with like-minded groups to optimize community response along the Gulf Coast.

ALGAL BLOOM DYNAMICS

Algae are microscopic, plant-like organisms that can experience rapid population growth known as "blooms." For some species, these blooms negatively affect coastal water quality, harm marine life, and curtail recreation. To discover the mechanisms that trigger these harmful algal bloom (HAB) events, Edward Phlips, a professor with the UF/IFAS Fisheries and Aquatic Sciences Program, began monitoring and collecting data regarding environmental conditions in a lagoon system along Central Florida's Atlantic coast in 1997. Water-management district officials used the comprehensive dataset to assess and design a variety of HAB management programs that reduce and mitigate the harmful effects of HAB, including reducing nutrient loads, increasing water-flushing rates, removing sediment, and fixing leaking septic tanks.



BEHAVIORAL IMMUNITY

The Caribbean spiny lobster, *Panulirus argus*, supports fisheries worth about $45 million to $60 million annually to Florida producers. A waterborne virus known as PaV1 has impacted populations since at least 2000 but never reached epidemic proportions. Donald Behringer, an associate professor in the UF/IFAS Fisheries and Aquatic Sciences Program, led a study showing that healthy spiny lobsters avoid contact with infected specimens, warned by chemical cues. This phenomenon, known as "behavioral immunity," was demonstrated with experiments that included tethering infected animals near occupied lobster dens in the Florida Keys. Further analyses cross-referencing long-term population data and using computer modeling supported the conclusion that behavioral immunity has minimized PaV1 transmission rates, providing evidence that the fishery can remain open for commercial and recreational harvesters.

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