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Florida Gulf Coast University's Norm and Nancy Vester Marine and Environmental Sciences Research Field Station (Vester Field Station)

ASWANI K. VOLETY, DONNA P. HENRY, AND RONALD TOLL

NORM AND NANCY VESTER MARINE AND ENVIRONMENTAL SCIENCES RESEARCH FIELD STATION, FLORIDA GULF COAST UNIVERSITY

"Established on the verge of the 21st century, Florida Gulf Coast University infuses the strengths of the traditional public university with innovation and learning-centered spirit, its chief aim being to fulfill the academic, cultural, social, and career expectations of its constituents.

Outstanding faculty uphold challenging academic standards and balance research, scholarly activities, and service expectations with their central responsibilities of teaching and mentoring. Through these efforts, the faculty and university transform students' lives and the southwest Florida region.

"Florida Gulf Coast University continuously pursues academic excellence, practices and promotes environmental sustainability, embraces diversity, nurtures community partnerships, values public service, encourages civic responsibility, cultivates habits of lifelong learning, and keeps the advancement of knowledge and pursuit of truth as noble ideals at the heart of the university's purpose." (FGCU Mission Statement, FGCU Board of Trustees, 2010; <http://www.fgcu.edu/info/mission.asp>)."

DESCRIPTION OF FLORIDA GULF COAST UNIVERSITY AND ITS HISTORY

The history of Florida Gulf Coast University (FGCU) is a visionary one built on support for providing higher education opportunities in Southwest Florida. With support from the Florida Board of Regents and the full Florida Legislature in Jan. 1991, the development of Florida's tenth state university to be located in Southwest Florida began. Plans for the first phase of campus construction were unveiled in Feb. 1994, and shortly thereafter, the Florida Legislature named the institution Florida Gulf Coast University. Campus groundbreaking was held on 28 Nov. 1995, and the university opened for classes in the fall of 1997 and was awarded accreditation candidacy later that year by the Southern Association of Colleges and Schools. FGCU first opened with just over 100 instructional

faculty, two academic buildings, a library, and approximately 2,500 students. Student growth ranged between 13% and 25% annually and continues to grow. In the fall of 2009, the university celebrated its tenth anniversary with an estimated enrollment of 11,200 students, and a 10% to 15% growth per year is expected to continue into the near future.

Given the emphasis on environmental sustainability, ecological perspective is listed as one of the learning outcomes for FGCU students (<http://itech.fgcu.edu/sacs/QEP-2005.pdf>) and undergraduate programs in marine science, environmental studies, and the graduate program (M.S. in Environmental Science) continue to be strongly supported.

Goal 3: Ecological perspective. Know the issues related to economic, social and ecological sustainability. Analyze and evaluate ecological issues locally and globally. Participate in collaborative projects requiring awareness and/or analysis of ecological and environmental issues.

Department of Marine and Ecological Sciences.—Florida Gulf Coast University upholds a strong emphasis on environmental issues and places a unique importance on environmental sustainability. In collaboration with the Departments of Biological Sciences, and Physical Sciences and Mathematics, the Department of Marine and Ecological Sciences (MES) offers students a curriculum that emphasizes hands-on learning with extensive laboratory and field-based activities in terrestrial and marine settings. The MES houses undergraduate programs in marine science and environmental studies as well as the M.S. in environmental science and M.A. in environmental studies. As part of their curriculum, *all* marine science and environmental studies students engage in an internship experience at local and state agencies and/or conduct independent senior research under a faculty mentor and present their findings at a "research day" on campus or at a local, state, or national meeting. Given the emphasis on environmental/marine science, and its location in the coastal town of Ft. Myers, FGCU has been looking to acquire a parcel of land to concentrate its marine

Fig. 1. Aerial view of FGCU's Vester Marine and Environmental Sciences Research Field Station. (1) Main building ($\sim 4,000$ ft² air conditioned) for class room, office space, dry lab space, and conditioned storage space; (2) Building two—a complex of four apartment units that were modified to house the shellfish hatchery, wet lab, dry lab, conference room, and a guest suite ($\sim 2,000$ ft² air conditioned); (3) Visiting scientist quarters ($\sim 4,000$ ft² air conditioned). Eight one-bedroom apartments to house visiting scientists. Building is on pilings. Below the apartments are the running sea water systems with sand, charcoal filters, and ultraviolet sterilizers, as well as raceways and tanks for fish and shellfish, with plumbing capable of delivering raw, filtered, or filter-sterilized seawater. Building is equipped with an elevator. (4) Storage shed. The facility has 11 boat docks including five on lifts (two solar powered boat lifts have been added since this picture was taken).

science research and providing access to local estuarine and coastal environments to students. Owing to the booming housing market and increasing land values, especially around FGCU's main campus in Ft. Myers, acquiring a parcel of land in close proximity to house a marine laboratory/field station activities and to provide students with easy access to estuarine and coastal environments has been a challenge.

DESCRIPTION OF FGCU'S VESTER MARINE AND ENVIRONMENTAL SCIENCE RESEARCH FIELD STATION

In June 2007, the FGCU Foundation acquired a waterfront facility to support the university's marine and environmental science programs. The property (0.55 acres landward and 0.31 acres seaward) is located 14 miles from the main campus on Little Hickory Island in Bonita Springs, FL (Fig. 1). The FGCU Vester Marine and Environmental Science Field Station was the brainchild of Norm and Nancy Vester, who owned and managed the facility when it was a

resort (Bonita Beach Plantation Resort). The burden of managing the resort led them to look at new opportunities, and instead of selling the property for use as a resort, which they feared would lead to a drastic change in the landscape, they looked to FGCU. The inspiration for the field station came after the Vesters met with administration and faculty in marine and environmental sciences. With the growth of the university and its focus on stewardship of the local environment, the facility offered great potential for its research and education programs. The university had been working for a number of years to acquire a parcel of land for the purposes of building a marine lab, but had been unable to acquire the resources to fund such a facility. With a donation in excess of \$1 million from the Vesters, the university was able to purchase the property and buildings to the mutual benefit of both. The Vesters will stay on the property in season for the next 5 years and look forward to interactions with the research faculty and students. From their vantage point,

boat and student activity at the FGCU Vester Marine and Environmental Science Field Station will be a welcome addition to their south Florida experience. Given FGCU's focus on environmental issues, the facility has the support of Dr. Wilson Bradshaw, provost and vice president of academic affairs, Dr. Ron Toll, also a marine scientist, and Dean Donna Henry. The facility, which is mainly used by faculty, staff, and students in the College of Arts Sciences, was managed by the Department of Marine and Ecological Sciences Chair, Aswani Volety.

The property consists of a main residence that includes an instructional space and faculty and student workspace; an eight-unit apartment building, as well as a multipurpose building with an additional apartment, a conference room, and both a wet and a dry lab. All three buildings are equipped with wireless internet access (see Figs. 1-2). The site is surrounded by water on three sides and includes 11 boat slips, providing easy access to such diverse habitats as mangroves, oyster reefs, mud flats, and seagrasses. The initial renovation created small research spaces that enable faculty and students to conduct laboratory and field experiments requiring running sea water. In addition, an experimental shellfish hatchery, for oyster-reef restoration activities along with temporary holding facilities for marine animals, was also constructed.

The on-site apartments can accommodate visiting scientists, guest speakers, and collaborators for short-term visits or extended stays. There are 24 bunk beds and four one-bed rooms to accommodate visitors. Above all, its proximity to the main campus, its location in the Estero Bay Aquatic Preserve, and its boat docks and lifts provide unparalleled access to FGCU faculty and students, as well as visiting scientists, involved in research and training. In addition, proximity to recreational areas such as beaches, canoeing, and kayaking facilities, as well as an international airport, all add to the allure of this facility in attracting visiting scientists.

This field station enables FGCU to locate a portion of the growing fleet of boats (currently eight), as well as canoes, on site with direct access to Estero Bay and the Gulf of Mexico, thereby greatly reducing time spent towing and launching boats. The expanded research capabilities provided by the field station will also allow for longer-term experiments on marine organisms than is currently possible on the main campus. Finally, the field station will enable FGCU to be more fully engaged in restoration activities (e.g., community-based restoration of oyster reefs) within the Estero Bay Aquatic Preserve and to expand marine environmental education and

outreach to local middle and high school students. FGCU researchers have begun using, or planning on using, this facility not only for teaching and outreach but also for research activities that significantly aid the understanding of water-related issues in Southwest Florida. Such projects include investigating the impacts of red tides on marine organisms; the effects of variable freshwater inflow and resulting salinity changes on marine organisms including the larvae of various bivalves, fish, and crustaceans; examining the role of nutrients in the development of macroalgae and red ties; investigating the role of contaminants such as copper, mercury, and oil pollution on marine organisms and the transfer of these chemicals up the food chain; and assessing how global climate change may play a role in reshaping the coastlines of southwest Florida. The FGCU Vester Marine and Environmental Science Research Field Station will further the university's role in the coordination of research activities and information needs related to Estero Bay, the Caloosahatchee watersheds, and the southwest Florida region in general. The additional research capacity and greatly improved access to coastal waters will no doubt attract collaborators from around the world to work in a unique subtropical environment that harbors diverse environments. We view the facility as a component of the broader research mission of the university that spans the coastline from the Ten Thousand Islands and Rookery Bay to Charlotte Harbor.

Facilities, equipment and other resources.—The Vester Field Station currently has two small labs (wet and dry) to facilitate laboratory and classroom research; an experimental shellfish hatchery; a well-equipped running seawater system with sand and charcoal filters as well as a sterilizing system; a classroom with audio-visual equipment; a small conference room; and office space with five desks. The facility is also equipped with wireless internet access. The laboratories have a level 2 biosafety cabinet/cell culture hood, two Thermo Fisher Scientific incubators with lights, five Olympus compound microscopes, five Olympus dissecting scopes, several freezers and refrigerators, an Eppendorf bench top, refrigerated centrifuges, an Olympus compound fluorescent microscope, a distilled water system, an autoclave, two ultraviolet purification systems, assorted field and laboratory equipment, four desktop computers, and small bench-top instruments such as balances, pH meters, pipettes, etc. In addition, a continuous monitoring YSI data sonde that collects temperature, dissolved oxygen, salinity, and pH is deployed at the site to

Fig. 2. Aerial view of Vester Field Station. Field station is located on the bay side (Estero Bay) in a mangrove setting, with easy access to mangroves, oyster reefs, seagrasses, mud flats as well as to the Gulf of Mexico.

monitor water quality. In support of the field station and faculty work, several community members have donated resources (e.g., 20 foot deck boat, 20 foot pontoon boat, 25 foot C-Hawk, 2 solar powered boat lifts, \$30,000 to enhance the flow-through seawater system).

Unique aspects of ecosystems and organisms accessed through the field station.—The field station offers unique access to Estero Bay as well as to the waters of the Gulf of Mexico. In 1966, Estero Bay

was designated the first aquatic preserve in the State of Florida. Although much of the lower estuary is protected, its principal tributaries—the Estero River and Imperial Rivers and Hendry, Mullock, and Spring Creeks—are increasingly subjected to development in the upper portions of their watersheds. Minimum water flows and levels are planned for this estuary to ensure that further changes in land and water use minimize ecological impact and protect existing water resources. This estuary provides a natural laboratory

for examining the influence of variable freshwater inflow and anthropogenic impacts on estuarine ecosystems: the estuary is relatively small at 170 km², yet it is fed by five tidal tributaries, each delivering differing amounts of inflow to the system.

Estero Bay is a shallow lagoon-type estuary, bordered on the west by a chain of barrier islands and home to diverse coastal habitats. Many of these habitats serve as important nursery areas and create complex, three-dimensional structure for use by resident species as well. Mangroves typically fringe the undeveloped shorelines of the bay and lower tidal tributaries, with four species present: red mangrove, *Rhizophora mangle*; black mangrove, *Avicennia germinans*; white mangrove, *Laguncularia racemosa*; and the buttonwood, *Conocarpus erectus*. Though mangrove communities dominate the bay's shoreline, salt marshes are present, with cordgrass, *Spartina alterniflora*; needlerush, *Juncus roemerianus*; salt grass, *Distichlis spicata*; and slender cordgrass, *Spartina patens*, being found progressively upstream. Seagrasses, another important nursery habitat, are represented by turtle grass, *Thalassia testudinum*; manatee grass, *Syringodium filiforme*; shoal grass, *Halodule wrightii*; and widgeon grass, *Ruppia maritima*. Oyster (*Crassostrea virginica*) reefs are best developed in the northern Bay where they occur immediately downstream of tidal tributaries. In addition to serving as nursery habitat for some juvenile fishes, these reefs are home to dozens of resident fishes and decapod crustaceans that serve as forage for important fisheries species. In addition to these vegetated habitats, mud flats and sand bottoms are also present.

Florida is second only to Alaska in the length of its coastline and has more coastline than all other Gulf of Mexico or Mid-Atlantic Bight states combined. Much of the Florida coast runs along a north-south axis, covering over 6 degrees of latitude, making it ideal for examining the effects of climate change on faunal distribution. Furthermore, the field station itself is located just 50 km north of Cape Romano, recognized as an important zoogeographic boundary between tropical and temperate shallow-water fauna. This part of Florida is therefore influenced by both tropical and temperate fauna and is especially well situated for monitoring the influence of climate change on the distribution and abundance of coastal species along the Florida peninsula.

Development of a strategic plan for Vester Field Station.—The acquisition of the field station presents a unique set of challenges and opportunities for conducting research and training in

marine science and the study of coastal watersheds. To date, the facility has been renovated and outfitted with equipment, initially through the university foundation funds and subsequently on a limited budget and primarily on a project-by-project basis. We are in the process of shifting from a tactical approach to increasing research and training capacity at the site (with growth occurring in spurts as money for specific projects become available) to a strategic plan that would impact a broader group of faculty and students and result in a more thorough and inclusive use of the facility. With support from the National Science Foundation through a planning grant, FGCU is engaged in the development of a strategic plan. Through this strategic plan, we hope to develop a 5-yr strategic plan for facilities use and improvement that will drive research, training, and outreach and will guide future renovations, equipment purchases, and other infrastructure support at the Field Station. Steps in the strategic planning will involve: (1) needs assessment, (2) core facility, (3) graduate training, (4) visiting scientist program, (5) educational outreach, and (6) facilities program.

FGCU researchers already have big plans for using this facility not only for teaching and outreach, but also for research activities that significantly aid the understanding of water-related issues and quality of life in southwest Florida. For example, plans are under way to investigate the impacts of red tides on marine organisms; to examine the interaction between water flows and sediment transport and its implications for beach erosions and build-up; to study the effect of freshwater inflows on marine organisms and on larval stages of various bivalves, fish, crustaceans; to refine techniques used in restoration science; to examine the role of nutrients in the development of macroalgae and red ties; to map aquatic vegetation; to study the role of contaminants such as copper, mercury, and oil pollution on marine organisms and the transfer of these chemicals up the food chain; and to characterize the environment before humans arrived in Florida and assess how global climate change may play a role in reshaping the coastlines in southwest Florida and its impacts on coastal and estuarine environments.

The FGCU Vester Marine and Ecological Environmental Science Field Station will further the university's role in coordination of research activities and information related to Estero Bay and Caloosahatchee watersheds. The additional space and prime location will promote collaborative opportunities for researchers both nationally and internationally to work in a unique

subtropical environment that harbors diverse environments that are easily accessible. We view the facility as a component of the broader research mission of the university that spans the coastline from the Ten Thousand Islands and Rookery Bay to the Charlotte Harbor Estuary. We thank both Norm and Nancy Vester for their vision and entrepreneurial spirit that has allowed this resource to develop for both the university and the southwest Florida region.

Future plans.—Currently, Vester Field Station use spans research, upper and lower level undergraduate classes, general education, and the University Colloquium class—a course required of all FGCU students that focuses on environmental sustainability. To date, most of the research at this facility has focused on investigating the health of local ecosystems, habitat restoration, and watershed alteration and its impacts. Use of this facility is coordinated through the College of Arts and Sciences and facilitated by a full-time employee (Mr. Robert Wasno). FGCU has signed a Memorandum of

Understanding for student and faculty exchange with University of Western Brittany, Brest, France, and with Bangor University, Wales, U.K. In addition, FGCU plans to offer joint M.S./Ph.D. programs with the College of Natural Sciences, Bangor University. We anticipate hosting more students from overseas, as well as from other academic institutions in the United States. We are also hosting several student interns from the Ecole Nationale Supérieure Agronomique de Toulouse, France, every year to work on research related to exotic green mussels, shellfish–red tide interactions, and the effects of salinity on the early life stages of oysters. Future steps in the development of the Vester Field Station include establishing an advisory board and an active visiting scholar and internship program, as well as appointing a full-time director of the Vester Field Station.

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