A STRATEGIC PLAN FOR
HARBOR BRANCH OCEANOGRAPHIC INSTITUTE
AT FLORIDA ATLANTIC UNIVERSITY
2012–2017
About the Strategic Plan ............................................................................................. 1

Introduction .................................................................................................................. 2

Our Living Oceans .......................................................................................................... 4
  1. Ocean Exploration .................................................................................................. 6
  2. Understanding Marine Ecosystem Function ......................................................... 8
  3. Wise Use of Marine Resources ............................................................................... 10
  4. Innovative Technology Development ...................................................................... 12

Stewardship of Our Living Oceans Through Partnerships ........................................... 14
  1. Training the Next Generation of Ocean Scientists and Engineers ...................... 16
  2. Partnering in Informal Education and Public Outreach ........................................ 18
  3. Cultivating Partnerships for Research and Development .................................... 19
  4. Accelerating University Integration ...................................................................... 20
  5. Enhancing Harbor Branch Community .................................................................. 21
  6. Wise Use of Harbor Branch Resources ................................................................ 22
ABOUT THE STRATEGIC PLAN

Harbor Branch Oceanographic Institute has begun a new and exciting chapter in its history. In 2007, we joined Florida Atlantic University after more than 35 years as an independent research organization. We are now part of a state university, culminating a relationship begun more than a decade ago that sets the stage for a bright future in which we can leverage extensive resources to make greater contributions to understanding Our Living Oceans.

The FAU 2012–2017 strategic plan, Making Waves: Celebrating and Cultivating Discovery, Diversity and Distinction, identifies three signature themes: Marine and Coastal Issues, Biotechnology and Contemporary Societal Challenges. While Harbor Branch can contribute to all three themes, we have a critical role in Marine and Coastal Issues. This theme leverages the marine science and technology research and education strengths at Harbor Branch and on the other FAU campuses, a system that spans 150 miles of coastline, that few universities can match. With the University looking to Harbor Branch to help lead the way forward, it is appropriate to define our strategic direction. This strategic plan lays out a set of themes and initiatives that link our strengths with the goals of the FAU strategic plan.

Margaret S. Leinen, Ph.D.
Executive Director, Harbor Branch Oceanographic Institute
Associate Provost of Marine and Environmental Initiatives
Although Harbor Branch began in 1971 as a private institution, the public has always been the ultimate beneficiary of our work. We expand on a proud tradition of innovation and exploration that built research submersibles to open the oceans to researchers who discovered deep coral reefs and other marine ecosystems, worked to protect them from destruction and identified disease-fighting compounds from marine organisms. Our scientists studied other marine ecosystems to advance knowledge and conservation, especially our nearby coastal waters and the Indian River Lagoon. We established aquaculture techniques that produce safe, sustainable food and economic development. We developed state-of-the-art programs to understand the health of marine mammals, their relationship to their environment and how to protect their populations.

This distinguished history of accomplishment and our outstanding faculty and staff allow us to take advantage of opportunities made possible by a wealth of new technology and a wide array of new partners with whom we can diversify our research and our funding. Challenging changes in our local ecosystems and the global ocean environment help to focus our research agenda. These challenges also motivate us to advance resource stewardship by conducting research that helps humankind better appreciate and protect marine resources, and by maximizing the efficiency of our own resource use.

As a part of a state university, we have an even greater responsibility to work in the public interest. We seek to better understand the oceans, educate students and the public, foster economic development and champion environmental research and conservation at regional, state and national levels. Our FAU affiliation also expands our opportunities to collaborate in pursuit of these ends.

Our Living Oceans: Research, Partnerships & Stewardship for the Future is a strategic plan for Harbor Branch. Every faculty and staff member had opportunities to join in the development process, which was enriched by input from our FAU colleagues, the Harbor Branch Oceanographic Institute Foundation Board and many of our external partners. This document lays out a set of themes for our research, our contribution to education, our community engagement and our Harbor Branch community life. We also have identified strategic initiatives that provide blueprints for rapid progress in these themes. Several of the initiatives are underway, and all are considered priorities for investment.
Our Living Oceans: Research, Partnerships & Stewardship for the Future expresses our commitment to our vision:
Ocean Science for a Better World.®
Two things are unique about our planet among all of the objects we have so far observed in the universe—the surface of our planet is dominated by oceans and the planet teems with life. And of course, life on Earth and in the oceans are closely related. That life, including humans, depends on the oceans. Oceans regulate weather and climate, they provide most of our oxygen and stabilize the composition of the atmosphere, and they feed much of the world’s human population. We are inherently connected to and reliant on the oceans. This amazing interdependence provides our research with a framework and its theme for the next decade: Our Living Oceans.

Recent national ocean policy studies by the U.S. Commission on Ocean Policy and the Pew Oceans Commission have highlighted the importance of the oceans to humans and have identified changes in our oceans, including a diminished capacity to support the planetary ecosystem on which our agriculture, marine resources, global economy and culture are based.

Harbor Branch Oceanographic Institute will build on its history of integrating science, engineering, technology, education and community engagement to explore and develop a profound understanding of Our Living Oceans, the opportunities they present and the issues they face. From this foundation we will foster innovation and collaboration within our institute, with our Florida Atlantic University colleagues, and with local, national and international partners to develop new strategies, products and technologies for wise use and stewardship of the oceans.

The Harbor Branch vision, Ocean Science for a Better World, motivates our scientists, engineers and the entire Harbor Branch community to address the challenges that face our oceans. In this plan we discuss both research and ancillary opportunities and selected initiatives to meet these opportunities.

The theme of our next decade of research, Our Living Oceans, encapsulates our dedication to address contemporary and emerging challenges and opportunities faced by our oceans.

- We will discover new ocean processes, species and marine resources with leading-edge exploration and mapping tools.
- We will investigate key marine ecosystems with innovative observation, monitoring and modeling technologies to better understand the systems and to provide vital information for improved management.
- We will apply this knowledge to predict the potential effects of human impacts and climate change on ocean processes, ecosystems and resources.
We will develop best practices for effective habitat restoration.

We will develop new ways to wisely use marine resources to improve human health through both nutritional and medicinal applications.

We will advance the use of marine resources as alternatives to fossil fuels for energy production and industrial chemicals.

We will develop new technologies that enable ocean science.

Over the next decade, Harbor Branch scientists and engineers will focus their efforts on the following themes:

- Ocean Exploration
- Understanding Marine Ecosystem Function
- Wise Use of Marine Resources
- Innovative Technology Development

We will develop and implement strategic initiatives, most of which will cross one or more of our theme areas. We will review our initiatives and add new ones as our research programs grow. Our initial five initiatives are:

- Ocean Exploration Platforms for the 21st Century
- The Indian River Lagoon Observatory (IRLO)
- Land-Based Integrated Multi-Trophic Aquaculture (LB-IMTA)
- Advanced Undersea Technology
- Core Laboratory for Integrative Molecular Biosciences (CLIMB)
The oceans cover more than 70% of Earth’s surface, support much of the biodiversity and provide incalculable living and nonliving resources. Despite their importance, the oceans remain largely unexplored: it has been estimated that as much as 95% of the oceans and 99% of the ocean floor remain to be explored visually. With so much to be known, discoveries in this context tend to be transformative, underscoring the value of exploration. For example, discovery by Harbor Branch researchers of entirely new marine habitats such as the deepwater Oculina coral reefs off Florida’s east coast has opened new questions about how these habitats serve as nursery grounds for commercially important species.

Exploration is the first step in ocean inquiry; through disciplined exploration we discover new environments, organisms and phenomena. The Census of Marine Life, involving thousands of scientists from 80 nations, recently concluded a decade of exploration and added more than 6,000 new marine species to the almost 250,000 already known. This is estimated to be only a fraction of the species still to be discovered and described, and even less is known about the abundance and ecological functions of these new organisms. An example of exploration is our continued discovery of new deep-sea coral ecosystems and our increasing insight into the diverse, commercially important living marine resources they support.

Disciplined exploration also helps identify research areas that are likely to produce tangible benefits. Many deep-sea organisms are sources of novel antibiotic, anti-cancer and anti-inflammatory drugs. Ocean exploration contributes to the discovery of new energy sources and to the protection of the habitats where they are found. Ocean exploration has led to the discovery of spawning grounds for critical fisheries and to protection of these resources. Exploration helps reveal the effects of pollution, overexploitation, acidification and rising temperatures, which is the first step toward addressing such threats. And because ocean exploration often involves extreme, hostile environmental conditions that require advanced technologies, it is an ongoing stimulus for innovation. Major questions that our researchers will address include:

Which ocean frontiers are the most critical to explore?
With up to 95% of the oceans left to explore, the challenge is to select and prioritize regions that will best support our vision. Our focus will be exploring and mapping outer continental shelf edge frontiers and deepwater coral reefs. These areas of the oceans are most vulnerable to human impact, including escalating climate change, and therefore should be documented and studied before they are lost. Identification of specific priority areas will be based on decades of experience coupled with emerging national and regional priorities.

How will we efficiently identify, characterize and expand knowledge of marine life and habitats?
With human impacts on marine environments accumulating and much of the oceans left to explore, we need to increase the pace, scope
Harbor Branch was founded with the goal of developing tools and platforms that enable ocean exploration. Use of these tools has led to the discovery and protection of spawning grounds for commercially and ecologically important species, the provision of lead compounds for the treatment of cancer, enhanced understanding of processes such as vertical ocean migration, and the protection and exploration of deepwater cultural assets such as USS Monitor. The ability to not only survey habitats but also deploy and recover monitoring equipment, and, more importantly, collect specimens, has set Harbor Branch and partner organizations apart in our ability to study deep-sea habitats, organisms and processes. This initiative seeks to develop the next generation of ocean exploration platforms to enable continued discovery on a global level.

Ocean Exploration Platforms for the 21st Century

Harbor Branch’s discovery of entirely new marine habitats such as this deepwater Oculina coral reef off Florida's east coast has opened new questions about how these habitats serve as nursery grounds for commercially important species. This knowledge will enhance our understanding of the interconnectedness of marine resources, ecosystems and humans, and allow for better stewardship.

The new tool platforms will:
- Enable exploration and research applications from mid-water to benthic habitats, with the capability to both observe and collect while operating over rugged terrain and in strong currents
- Be capable of rapid and economical deployment from a variety of platforms worldwide
- Incorporate the latest technology for propulsion, power, telemetry, positioning, stability, imaging, sampling, visualization and in situ analyses, including development of new advanced technologies
- Enable “telepresence” to share the exploration experience with collaborators, students and the public

A variety of options exist for what the platforms could be (e.g., tethered remotely operated vehicle, semi-autonomous underwater vehicle, remotely supervised tetherless vehicle). Our first step will be to conduct a full assessment of current and emerging technologies in collaboration with partners in academia, government and the commercial sector to develop a plan to create one or more platforms that meet the needs of the research community while advancing the field of undersea robotics. This initiative will allow Harbor Branch and our partners to continue the tradition of deep-sea exploration and research that has led to paradigm-changing discoveries in ocean science.
2. UNDERSTANDING MARINE ECOSYSTEM FUNCTION

A marine ecosystem contains thousands of types of organisms—bacteria, plants, algae, plankton, fishes, mammals, birds and humans, to name a few—all connected in a complex food web intimately tied to the environment. Understanding these tightly interlinked connections and their dynamics over time is essential to identifying and conserving the full range of goods and services supplied by marine ecosystems.

Increasing chemical and biological contamination (e.g., harmful algal blooms, endocrine disruptors), loss of marine biodiversity, collapsing fish stocks and widespread degradation of coastal and ocean habitats (e.g., marine “dead zones”) negatively impact human health and coastal economies. Important ocean characteristics are being altered, many within our lifetime, as part of rapidly accelerating global changes. Improved understanding of ecosystem function is critical to predicting and managing the consequences of environmental variability and human impacts.

The issues that our research addresses are globally important, with applications far beyond our immediate study areas. Major questions that our researchers will address include:

- Understanding Marine Ecosystem Function

The Indian River Lagoon Observatory (IRLO)

The Indian River Lagoon (IRL) is a unique, highly biodiverse, shallow-water estuary that spans 40% of Florida's eastern coastline. The lagoon’s economic value to Florida is estimated at $3.7 billion per year from recreational, environmental, real estate, restoration and fishing benefits. Urbanization and agriculture have changed the IRL’s watershed and increased human impacts on IRL’s ecosystem.

Development and implementation of effective management criteria are needed to protect the IRL and the quality of life it affords. Harbor Branch, with its scientific expertise, ideal geographical location and long history of IRL research is poised to be the leading organization for integrated IRL research and for assembling the many organizations that study the IRL. IRLO is a long-term, multidisciplinary, ecosystem-based program that will address emerging issues of environmental health by determining the IRL’s primary ecological functions and how these dynamics are impacted by stressors including the surrounding human population.

We will:
- Develop a long-term (initially five years) science research and technology plan for IRLO that:
  - Defines and prioritizes key integrated, hypothesis-driven studies that are quantitatively linked together to answer questions on the IRL ecosystem
  - Articulates the long-term monitoring requirements needed to capture the variability of critical environmental and biological factors in the IRL
  - Identifies the core research support, researchers and facilities minimally needed to sustain IRLO
- Develop and maintain a comprehensive environmental database for the IRL ecosystem
- Organize and hold an annual Indian River Lagoon Symposium to engage all active researchers and agencies working in the Indian River

IRLO will provide solutions to emerging threats both in the IRL and throughout Florida’s vast estuarine and coastal resources, and be a signature program for FAU research, education, outreach and development.
How do marine ecosystems function?
Harbor Branch seeks a deeper understanding of the changing marine environment and its consequences through research on marine plants, animals, microbes and their environments, and relationships among these systems and human activities. We will determine how important marine habitats and their ecologically and economically important species are connected and how biological resilience may be enhanced. We will expand our intramural and extramural collaborations to strengthen our multidisciplinary perspective, to observe our study sites for longer periods of time and to conduct a broader range of experiments for enhanced understanding and predictive capability in ecosystem responses to changing conditions. Our collaborations will facilitate use of results from our study sites for predictive responses in other systems.

How will cumulative effects of multiple human activities impact marine ecosystems?
To sustain marine ecosystems, it is important to address impacts of increasing pressures from human activities. Our research will investigate relationships between environmental exposures to chemical pollutants, microbial pathogens and biotoxins on the health of key marine organisms such as corals, seagrasses and marine mammals. We will determine how today’s activities (e.g., commercial fishing practices, altered nutrients in runoff) and tomorrow’s technologies (e.g., ocean energy extraction) affect marine life and their ecosystems. We will apply our data in environmental health models that will lead to the ability to predict impacts on biodiversity and ecological function, forecast stressor events and protect both human health and marine resources. Our research will lead to better identification and reduction of pollution impacts on marine resources and protection of marine biodiversity and habitats.

How will climate change impact our oceans?
Climate change is a key driver in habitat change and degradation. Our scientists will identify critical marine components of climate change, determine indicators of change and processes to monitor them and investigate adaptation strategies. We will give special attention to ocean acidification, a consequence of rising atmospheric carbon dioxide, because of its profound effects on tropical reef systems and its importance to marine ecosystems in general. We will determine how ocean acidification varies both by location and the timing of its impacts in critical marine ecosystems to help shed light on this global phenomenon.

How can degraded marine habitats be restored?
Important marine ecosystem functions and services may be lost through decades of degradation or in one catastrophic event. The uncertain effects of climate change add complexity to restoration decisions. We will combine our expertise in marine ecosystem science, molecular bioscience and aquaculture techniques to identify and reduce causes of decline and provide solutions for successful restoration of key habitats and organisms (e.g., seagrasses, corals, fish, oysters). We will focus on coastal zones and estuaries, which provide essential nurseries for many species and face higher degradation risk by human impacts. Our research will provide valuable contributions to agencies that must prioritize and implement best management practices for conserving marine habitats. These actions will reverse the degradation of critical marine habitats and enhance living marine resources for future generations.
The diversity of ocean habitats is exceptional: open ocean, abyssal plain, continental margins and slopes, nearshore waters, lagoons and estuaries, deep and shallow reefs, caves, blue holes, vents, seeps, grass beds, oyster and mussel beds, kelp forests, tide pools, shipwrecks, pilings and jetties represent but a portion. Within these habitats, microbes, plants and animals abound, all with special adaptations to their environments. This extraordinary biological diversity can be leveraged to produce nutritious food for a growing population, species for habitat restoration and pollution control, industrially relevant enzymes and molecules and new medicines. Wise use of these varied marine resources requires understanding their function and relationship to the environment, as well as development of best practices that enable us to address important challenges with maximal sustainability and minimal environmental impact. Major questions our researchers will address include:

**How do we best capitalize on marine biotechnology to address critical human health challenges?**

In addition to personal impacts on individuals, the combined U.S. economic impact of just three major diseases (cardiovascular disease, cancer, and Alzheimer’s) is more than $800 billion per year. Natural products—small organic molecules produced by plants, microbes and animals—have been extremely important in the development of new medicines, with more than 60% of the therapeutics currently in clinical use evolving from natural product structures. Important examples include Taxol®, adriamycin, penicillin and the statins. Like their terrestrial counterparts, marine organisms offer considerable promise for the discovery of natural products that lead to the development of clinically useful agents. Through use of emerging understanding of what drives disease initiation and progression, we will discover compounds that can lead to better, more selective therapies for treating disease. To expand the disease areas in which we can make an impact, we will collaborate broadly with the academic and commercial life science sectors. Research will also capitalize on the rapid expansion of genomics, which is delivering opportunities to identify, modify and express genes responsible for the biosynthesis of natural products. This work will provide sustainable supplies of compounds for clinical use, as well as compounds with enhanced potency and fewer side effects.

**How can we develop new renewable energy resources?**

Another compelling challenge that influences the oceans is the world’s dependence on fossil fuels as a source of both energy and industrial chemicals. We are exploring the diversity of marine microorganisms, many of which are adapted to unique niches of the marine environment, as sources of biotechnological products. This research will provide a sustainable, environmentally sound source of enzymes useful in the production of alternative fuels, a source of biomass for the production of renewable fuel stocks and a resource for the production of small molecules used to prepare industrial chemicals such as plastics. Our engineers will conduct research in open-ocean current and thermal energy production systems in
partnership with our FAU colleagues, which will lead to the development, testing and deployment of commercially viable, environmentally responsible ocean energy systems.

How will we secure affordable and sustainable seafood and other marine products for an increasing world population?

Rising seafood demand and collapsing wild fisheries have created urgency for advancing sustainably sourced fish and marine products. Population growth has driven seafood demand such that nearly 50% of all seafood consumed comes from aquaculture. Over the next 40 years, aquaculture production needs to increase at least 70% just to meet current consumption levels. Aquaculture is critical for food production, but the technology is also applicable to habitat restoration, supplementation of wild populations (stock enhancement) and production of biomass for biofuels, natural products and pharmaceuticals. We will study and develop methods and systems for producing healthy, affordable and sustainable marine products. We will continue to drive technology development to foster the growth of a sustainable U.S. aquaculture industry that produces safe, healthy marine products for food, industrial, pharmaceutical and ecosystem-health needs.

Land-Based Integrated Multi-Trophic Aquaculture (LB-IMTA)

An innovative technological solution to increasing seafood production and stock enhancement for restoration, the integrated multi-trophic aquaculture (IMTA) system combines the culture of organisms, such as fish, shellfish and seaweeds, to create a balanced ecosystem where “wastes” of one component serve as food, fertilizer or energy for the other components. Land-based IMTA (LB-IMTA) systems will provide a higher degree of biosecurity to ensure food safety, better management of waste discharge, lower water use and greater environmental sustainability compared to open-water systems and other land-based recirculating aquaculture systems.

We will:
• Advance the technology needed to make LB-IMTA systems environmentally friendly and cost-effective
• Develop technology (e.g., low-cost automation) to reduce labor costs and improve environmental control, thereby improving product quality and consistency from LB-IMTA systems
• Characterize microbial populations for health and food safety management of LB-IMTA systems
• Examine factors such as vaccine production, feed additives (e.g., probiotics) or nutritional formulations to reduce reliance on fishmeal and fish oil to enhance LB-IMTA systems

This initiative will position Harbor Branch as a leader in environmentally friendly, cost-effective, land-based aquaculture technology and support the growing marine aquaculture industry.
Critical to exploration, research and wise use of living marine resources is the development of technologies that enable us to observe, quantify, sample, cultivate and conserve the oceans’ diverse organisms and habitats. Major questions our researchers will address include:

What key technologies and platforms will we develop to advance ocean exploration and monitoring?

The development of innovative methods to access the oceans and to discover, identify and characterize important features is critical to ocean exploration and observation. We will develop engineering solutions to fundamental and technological challenges that presently limit our ability to explore the oceans, and create tools that advance robotic approaches to exploring, mapping, sampling and monitoring ocean environments. We will develop advanced data visualization and telepresence applications to enhance the human experience. We will develop next-generation sensor technology that will drastically extend autonomous temporal- and spatial-scale sensing, consume less power, employ energy-scavenging units and use space and airborne platforms for control, telemetry and movements of our vehicles and for corroboration of sensor data. We will also develop advanced mapping and imaging tools that will enable us to remotely perform detailed characterization of subsea features of interest.

Advanced Undersea Technology

Harbor Branch’s undersea sensing, imaging and communication capabilities are greatly enhancing the range, resolution, bandwidth and speed of data acquisition and processing. Further development of these technologies will result in Harbor Branch once again being at the forefront of ocean exploration technology with new and unique capabilities in ocean observation, seabed mapping, undersea networking and advanced sensors, with the following foci:

- Undersea communications and networking capabilities to enable wireless interaction among diverse mobile ocean-going platforms, ocean observatory nodes and air- and space-borne platforms
- Laser-acoustic ocean mapping sensors that greatly improve survey detail and quality for detailed site assessment
- Novel energy-scavenging technology for ocean observing systems and long-duration autonomous vehicle deployments
- Advanced data visualization and telepresence to enable remote operations and intervention
- Next-generation compact, power-efficient, cost-effective sensors for extended spatial- and temporal-scale ocean-observing platforms

Through collaboration with proven industry and academia leaders in underwater robotics and sensing, this initiative will significantly enhance ocean exploration and marine ecosystem health research at Harbor Branch by facilitating mapping, classifying, monitoring and specimen collection from benthic and mid-water communities.
Integrative molecular science approaches, including genomics, proteomics, metabolomics, parvomics and viromics, are transforming how we study and understand the natural world. The keys to successful development, implementation and application of these newly emerging technologies are a combination of high-throughput core capabilities and a critical mass of researchers that push the envelope in molecular science and bioinformatics.

We will:
- Create a core facility with high-throughput capabilities and expertise to support whole genome and transcriptome sequencing and annotation
- Develop capabilities in proteomics, including rapid protein expression profiling and molecular modeling to define small molecule-protein interactions

How will molecular approaches revolutionize our research?
Advances in genomics and scientific data processing have set the stage to enable rapid census of marine environments to assess connectivity and function. We will use leading technologies to study genes, proteins and modifications caused by activators or stressors. Through these new approaches we will gain quantitative and qualitative knowledge of marine organisms and the effects of human impacts on them. We will discover molecular signatures to allow for the quick identification and census of marine species from larvae to adult. We will apply these same tools to issues affecting human health, such as seafood safety and biotoxin detection. Our molecular research program will be supported by robust data processing capabilities to enable efficient analysis of large datasets. Harbor Branch will be known for its complete understanding of marine organisms from genes to functional processes.

How will our data synthesis lead to new understanding?
Data are the currency of science. Data synthesis integrates data, concepts or theories to generate new knowledge and understanding. Ocean science involves collecting, managing, using and storing large amounts of information from multiple modes of inquiry. We will foster a culture of data sharing and develop unified, user-friendly data storage architecture for large volumes of diverse environmental and biological information for our long-term research needs. We will develop new data dissemination tools to enable data abstraction and information integration to achieve multi-dimensional, multi-scaled, real-time monitoring and historical analysis of ecosystems. Such synthesis and rapid dissemination are essential to the acceleration of our scientific discoveries and novel insights. These actions will enhance and hasten our impact on how humans understand, conserve and benefit from the oceans and their resources—truly Ocean Science for a Better World.
FAU emphasizes active engagement with its communities in addition to the pursuit of excellence in teaching, research, scholarship and creative activity. We will emphasize the FAU values of excellence and active engagement in our interactions at Harbor Branch with our colleagues on other FAU campuses and with the community around us. Together with the University, Harbor Branch will play an important role in the educational, economic and environmental development of our communities and of Florida. This work will also make important contributions beyond Florida. Marine and coastal environmental challenges are complex and require that we join others with complementary capabilities. Opportunities to contribute to formal and informal education and to economic development will also benefit from expertise beyond that of Harbor Branch. These opportunities highlight the need for University and external partnerships in all that we do.

As an organization that studies marine and environmental science and technology, it is natural for us to focus on conservation and wise use of natural resources, and to share these findings with others. As part of the Harbor Branch commitment to responsible marine science and technology development, we will be good stewards of our human, physical and financial resources.

Partnership and stewardship frame our interactions at Harbor Branch, with the rest of the University and with our communities. We have identified six themes that will enhance our interactions with others:

- Training the Next Generation of Ocean Scientists and Engineers
- Partnering in Informal Education and Public Outreach
- Cultivating Partnerships for Research and Development
- Accelerating University Integration
- Enhancing Harbor Branch Community
- Wise Use of Harbor Branch Resources

We have selected the following initiatives as priorities:

- Graduate Degree Programs in Marine Science
- Mission: Ocean Discovery
- Fostering Life Sciences Collaborations on the Research Coast
- Face to Face: Connecting with our FAU Partners
- My Harbor Branch
- Resource Stewardship to Enhance our Campus
Through Partnerships

All research is carried out under NMFS Research Permit No. 14562-02
The human demands for use of ocean resources increase year by year, and the challenges that Florida and the country will face in a changing climate are becoming clearer. It is essential that Harbor Branch researchers share their cutting-edge research and train the next generation of ocean scientists and engineers to tackle the complex coastal and ocean problems of the 21st century.

This training will require teaching and research that draw on the application of interdisciplinary tools to address basic and applied scientific questions. Harbor Branch has developed a strong education and outreach program. We will partner with FAU faculty to develop a stronger and highly competitive academic program in marine science, with the goal over the next decade of launching FAU graduate degrees in marine science.

Graduate Students At Harbor Branch
Ocean science and engineering research conducted at Harbor Branch provides an exceptional opportunity to educate graduate students in our cross-disciplinary research themes and initiatives. Offering progressive, interdisciplinary coursework that teaches both the fundamentals and emerging frontiers of marine science, we attract top students to the program and enhance their ability to function and succeed in today’s multidisciplinary environments. Our on-site graduate courses focus on areas key to our research themes and augment those taught at other FAU campuses. We will expand formal education offerings through distance learning to take advantage of the marine science and engineering faculty at the other campuses and provide students on the other campuses access to courses taught at Harbor Branch. Additional distance learning courses will increase enrollment and connectivity to other FAU programs. We envision a greater partnership with our FAU colleagues to create interdisciplinary courses and enhance the development of technologies that advance our research. As new faculty members are recruited, the program will grow to encompass additional disciplines.

Semester By The Sea
Harbor Branch’s Semester By The Sea program provides undergraduates with a semester-long immersion in marine science. Its team-taught classes expose students to experts in many marine fields, attract undergraduates interested in marine biology to FAU and serve as a recruitment opportunity for FAU’s graduate programs. As Harbor Branch expands its faculty, additional classes will be developed according to our research themes and offered throughout the year.
Summer Intern Program
Our summer intern program began in 1974 and attracts top undergraduate and graduate students worldwide. Students experience a 10-week immersion in projects that touch on all aspects of research at Harbor Branch. Alumni often refer to this internship as the event that shaped their careers, as it led them to determine their field of study and impacted their graduate studies decisions. The summer internship program is another excellent recruitment opportunity for FAU’s graduate programs, and could be expanded to include similar opportunities for students during the rest of the year.

High School Education
The Marine & Oceanographic Academy (MOA), initiated by Harbor Branch with the St. Lucie County School Board in 2007, is a model for partnering a marine research institute with a public school system for improving the scientific literacy of high school students and their teachers. An ancillary benefit of MOA is that these students, who will be well versed in the sciences and academically strong overall, will be prime recruits for FAU. The MOA concept and programs to train high school educators could be expanded through FAU’s geographical range as part of a STEM (science, technology, engineering and math) initiative to improve the scientific literacy at the high school level.

Graduate Degree Programs in Marine Science
Over the next decade, and in collaboration with colleagues from the Colleges of Science, Engineering and Medicine, Harbor Branch will lead development of interdisciplinary M.S. and Ph.D. options in Marine Science within existing Ph.D. degrees. Our goal is to create a nationally recognized graduate program that distinguishes itself for providing an interdisciplinary research experience for students. Students in the program will be working on important questions within our research theme areas. Graduates from this program will have a sound base in oceanographic research and sufficient specialized knowledge to compete with graduates from the top universities in their own fields.

This initiative will:
• Identify current FAU courses that could contribute to interdisciplinary marine science M.S./Ph.D. degrees
• Identify additional individual and team-taught courses that will integrate into a cross-campus marine science program
• Develop e-classes and improve distance learning and transportation for cross-campus education
• Seek and obtain board authorization for an interdisciplinary M.S. and Ph.D. in marine science at FAU
Harbor Branch advances ocean literacy through outreach and education activities that excite and engage the public to understand the deep relationships between our living oceans and humanity. Our outreach efforts have enabled us to share the wonders of marine science and engineering with all age groups and to demonstrate that these concepts are relevant to the quality of their lives. Among the broad variety of Harbor Branch efforts to advance ocean literacy over the years are public tours of our research facilities, programming for visiting school and other youth groups, symposia, open houses, public lecture and film series and marine science summer camps. Exhibits and outreach activities at our Ocean Discovery Center engage the public in our research and education initiatives. By sharing our passion for marine science and engineering, we develop a constituency that becomes attuned to Harbor Branch research and, ideally, motivated to use the knowledge and ideas to help create a better world for all.

Our Ocean Discovery Center has served us well as a physical focus for our engagement with the public. As we expand our informal education and outreach, we will need to examine the role of the Ocean Discovery Center. How can the center best convey the impressive technology and important data and discoveries of Harbor Branch? How can the center attract a larger and broader audience? How can the center best serve the interests of a public that has become much more sophisticated about its use of electronic and social media?

2. PARTNERING IN INFORMAL EDUCATION AND PUBLIC OUTREACH

Engaging the public in marine science discovery is a vital means of building ocean literacy.

Mission: Ocean Discovery

To enhance our ability to transfer our knowledge and passion to the public, we will focus our informal education and public outreach efforts to create an integrated and sustainable program known as Mission: Ocean Discovery.

This initiative will:
- Provide inspirational educational opportunities for all ages
- Cultivate a population of “marine biologists in training” who enhance and are enriched by Harbor Branch programming through their continued presence and volunteer efforts
- Create a unified identity for current and future informal education and public outreach programming that enhances our ability to attract participants and funding
- Help make the Harbor Branch campus a more accessible community resource that reflects our University’s role as a source of knowledge and education
- Advance ocean literacy and the understanding that every individual can make a positive difference
3. CULTIVATING PARTNERSHIPS FOR RESEARCH & DEVELOPMENT

As a research institute of Florida Atlantic University, Harbor Branch engages with many constituencies. We:

- Collaborate with other research, education and environmental organizations
- Provide research assistance and data to governmental agencies and legislative bodies
- Interface with foundations, donors and volunteers who invest their interests, time and assets in what we do
- Team with industry and economic development groups to translate our work into new tools, products and business opportunities
- Work with community groups to enhance quality of life in Florida

We will leverage existing relationships and our visibility as part of FAU to foster partnerships that extend the reach of our work. For example, we will work with autonomous marine vehicle manufacturers on glider technology to advance ocean observation capabilities. By forming a consortium of organizations that work in the Indian River Lagoon, we can collect more research data and coordinate expertise into a virtual observatory—an Indian River Lagoon Observatory. Partnerships like these expand our capabilities, access to resources and ability to identify and pursue opportunities of scientific and/or commercial significance. We will focus on areas of convergence between our research themes and our responsibilities as a public institution, demonstrating our commitment to advancing a broad spectrum of regional environmental and economic development activities.

Fostering Life Sciences Collaborations on the Research Coast

Efforts to attract life sciences research organizations to southeastern Florida have centered biotechnology and biomedical companies at Port St. Lucie’s Tradition Center for Innovation and on FAU’s Jupiter campus. Government and research organizations hope to establish a life science research cluster analogous to California’s Silicon Valley technology cluster, turning our Treasure Coast region into the Research Coast. Harbor Branch has experience building a vibrant life science research program and transferring knowledge to industry, and the rest of FAU similarly is rich with collaborative potential. Our record of biotech and biomed research and technology transfer positions Harbor Branch to be a catalyst for additional Research Coast development.

This initiative will:

- Foster communication between FAU and the life sciences companies and other Research Coast entities to develop mutually beneficial partnerships
- Collaborate in the development of new instrumentation and laboratory capabilities
- Partner in recruitment of new life sciences firms and research organizations
- Help ensure that the Research Coast concept advances regional economic development
Face to Face: Connecting With Our FAU Partners

Personal interactions are the keystone of collaboration, productivity and accountability. Face to Face is an initiative to improve connections between Harbor Branch faculty and staff and our counterparts across FAU by accompanying regular video and teleconference communication with face-to-face strategic meetings to establish mutual agendas for research, education, operations and community engagement. This includes support staff as well as research and education staff, and emphasizes personal interactions.

This initiative will:
• Overcome geographic separations between Harbor Branch and other FAU sites by strengthening working relationships
• Enable exchange visits, seminars and networking events
• Increase sharing of information, ideas and resources across campuses
• Foster cultural integration and greater shared awareness of the diverse FAU system among all faculty and staff
Our greatest achievements have been based on an organization that fosters creativity, cultivates innovation and encourages imagination among employees. Maintaining such an environment requires that we continually strive to be a workplace that supports and encourages the individual while fostering the development of working groups. Ours must be a welcoming and inclusive culture that facilitates free-flowing, open and honest communication.

Such a community requires continued stewardship and a pervasive commitment to accountability, with each of us accountable to one another and to the community as a whole. We believe in a sense of shared ownership and responsibility for the kind of workplace that produces our best work.

This initiative will:

- Develop mechanisms for publicly recognizing and rewarding individual and group accomplishments
- Develop ways to rapidly introduce new members of the Harbor Branch community to our people, campus, mission and university
- Develop ways to keep existing community members informed and involved
- Provide continuing education and professional development opportunities for employees that foster peer-to-peer training, personnel retention and organizational efficacy
- Help every Harbor Branch employee understand how his or her work enables transformational marine science and technology discovery

My Harbor Branch

Harbor Branch is an exciting place to work because of our research mission, our size, the diversity of our activities and the singular nature of our facilities and surroundings. However, our size and diversity make it challenging to maintain a sense of community in which individuals understand the complete range of Harbor Branch activities as well as their part in advancing Harbor Branch’s mission. These challenges underscore the need for a systematic effort to foster greater shared awareness of the people and programs at Harbor Branch, as well as the work they perform.

Active participation by individuals in the future of Harbor Branch is the foundation of community.
Harbor Branch uses resources in pursuit of our mission including energy and water; physical assets such as equipment, vehicles and tools; and human capital in the time, effort and knowledge of our people. Conserving and wisely using these Harbor Branch resources will enhance our environmental and operational sustainability.

Resource Stewardship to Enhance our Campus

The Resource Stewardship initiative is an opportunity to study Harbor Branch operations and develop methods for improving resource efficiency. In addition to reducing consumption and waste generation, we will improve the efficiency of operational processes and physical asset use. To achieve these gains, we will complement in-house efforts and expertise with knowledge and experience from outside of FAU.

This initiative will enable us to:
• Conserve natural resources by optimizing energy and water use, reducing waste generation and minimizing overall environmental impact of campus operations and activities
• Optimize purchase and use of physical assets across our research site
• Optimize work efficiency through examination and revision of our administrative and operational processes
• Reallocate resource savings to research and education efforts, thereby advancing our organizational mission
• Become a model of efficiency for other organizations to emulate

Our location on the Indian River Lagoon estuary is a daily reminder of the importance of resource stewardship.
We wish to acknowledge our Florida Atlantic University colleagues who contributed to and reviewed this plan, the Harbor Branch Oceanographic Institute Foundation for supporting our work and the printing of this document, strategic planning co-chairs Dennis Hanisak, Ph.D., and Amy Wright, Ph.D., and primary editor Larry Macke.