COVER PHOTOGRAPH CAPTION AND FRONT MATTER

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COVER PHOTOGRAPH

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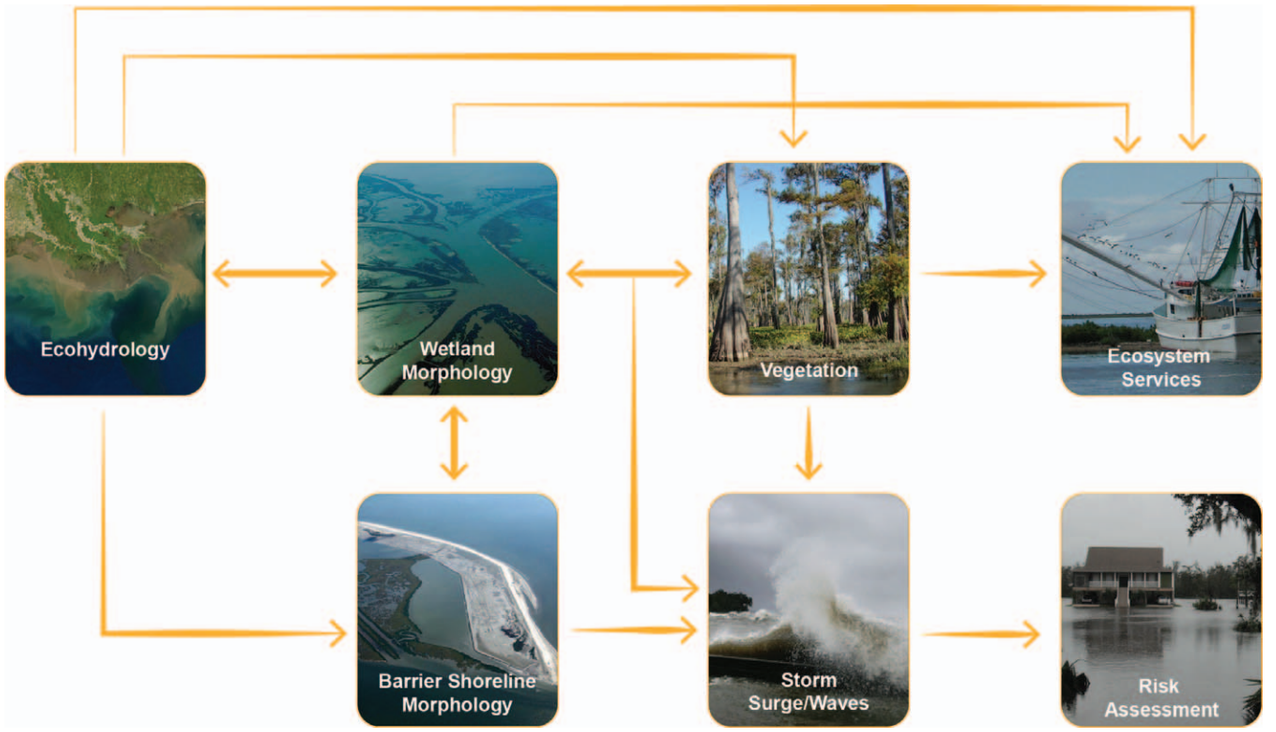

COVER PHOTOGRAPH

Diagram depicts the seven predictive model groups used in the master plan and their linkages. Along with the Planning Tool, the predictive models were used to determine how Louisiana's coastal landscape, ecosystem services, and communities' flood risk may change over the next 50 years. These tools helped to evaluate potential protection and restoration projects which comprised the 2012 Coastal Master Plan.

Photo credits: Ecohydrology photo provided by the U.S. Geological Survey; all other photos provided by the Coastal Protection and Restoration Authority.

CPRA
Coastal Protection and Restoration Authority of Louisiana

State of Louisiana

BOBBY JINDAL
GOVERNOR

March 1, 2013

Ladies and Gentlemen:

There is a renewed sense of hope for the coastal future of Louisiana, a hope rooted in science and a realistic appraisal of what can be accomplished in the near and long terms to halt—and begin to reverse—more than 80 years of coastal degradation that is affecting our lives, culture, infrastructure, ecology and economy. That hope is quantified and outlined in *Louisiana's Comprehensive Master Plan for a Sustainable Coast*, our 2012 update of the projects, programs and concepts we will implement to address the serious issues confronting us.

Louisiana is in the midst of a land loss crisis (due to both natural and man-made causes) that has claimed almost 1,900 square miles of land since the 1930s and, if nothing is done, we will be destined to lose thousands more. Given the importance of so many of south Louisiana's assets—our waterways, natural resources, unique culture and people, and jobs and industries—this land loss crisis is nothing short of a national emergency.

The catastrophe facing south Louisiana requires us to act quickly, or we will lose everything. Our communities will continue to wash away, our fisheries will collapse, and vital industries will not have the infrastructure or workforces essential to operations. The cost of inaction is devastatingly enormous, and these losses will impact the rest of the nation.

Louisiana's 2012 Coastal Master Plan represents a two year analysis involving some of the state's best scientists and engineers as well as national and international specialists. The state used this analysis to select 109 high-performing projects and supporting programs that could deliver measurable benefits to our communities and coastal ecosystem over the coming decades. The plan shows that if these projects were fully funded, at a cost of $50 billion, we could substantially increase flood protection for communities and put Louisiana on a trajectory for building land instead of losing it.

Knowing that the challenges we face in Louisiana are ultimately global in nature, we are pleased to share some of the science behind our decision making process, including the systems level predictive models we developed and the Coastal Protection and Restoration Authority (CPRA) Planning Tool that guided us in evaluating and comparing potential projects for implementation.

We appreciate the opportunity to disseminate the enclosed examples of how science is being used to help address real world problems in coastal Louisiana.

Sincerely,

Garret Graves
Chair, Coastal Protection and Restoration Authority Board

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PREFACE

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Louisiana's coast and coastal communities have experienced numerous natural and human-induced disasters over the past decade as environmental, social, and economic vulnerability have increased with continued land loss, increased hurricanes, and the effects of climate change. In response to the hurricanes of 2005, the Louisiana Legislature passed Act 8 of the First Extraordinary Session of 2005, which formed the Coastal Protection and Restoration Authority (CPRA) and tasked it with the development and five-year updates of a comprehensive protection and restoration master plan, commonly referred to as Louisiana's Coastal Master Plan.

CPRA produced the first coastal master plan, which was a ground-breaking effort to integrate coastal protection and coastal restoration, in 2007. This 18-month planning process produced an award-winning report that established goals and objectives and synthesized decades of coastal thinking about projects and solutions. The *2007 Coastal Master Plan* became the starting point for the *2012 Coastal Master Plan* effort.

With unlimited funding, sediment, and freshwater, we could successfully implement the *2007 Coastal Master Plan*. However, relying on this unlikely assumption does not provide a realistic future for our coastal residents. Thus, the key question for the 2012 planning effort became: "Which projects are predicted to meet our objectives considering these important resource constraints and what does the future look like with and without action?" CPRA relied on a team of over 60 scientists and engineers to develop a series of integrated, coastwide predictive models and a computer-based decision support tool, called the CPRA Planning Tool, to provide objective project evaluation. This systems-based modeling approach was coupled with an extensive outreach and engagement effort that integrated the public and stakeholders into the process and focused on transparency of the modeling results and the decision-making process. Through this process, the *2012 Coastal Master Plan* identified a specific list of projects that effectively invests limited financial resources to make the greatest progress toward achieving a sustainable coast. The *2012 Coastal Master Plan* was unanimously approved by the Louisiana Legislature in May 2012 without modification.

As directed by Statute, the master plan is a living document to be updated at least every 5 years. CPRA continues to advance modeling and research efforts for inclusion in the next master plan update. Since the completion of the 2012 Coastal Master Plan, the team has performed additional modeling to capture the interactive effects of all projects modeled simultaneously and to continue to learn and improve our modeling capabilities. The systems modeling approach provided the opportunity to test the effects of protection projects on the ecosystem and the effects of restoration projects on reducing risk. It is important to understand a few key variations in this subsequent modeling effort compared to the modeling effort that was used as the basis for the *2012 Coastal Master Plan*. These variations provide an understanding for why results described in this special issue may vary from what was reported in the master plan.

(1) For the new simultaneous modeling effort, the modeling assumed projects were implemented either at Year 0 or Year 25. Due to time and resource constraints, we were not able to implement projects incrementally over time to provide a more realistic timeline for project funding and construction. This assumption results in some graphics depicting an abrupt shift at Year 25 when new projects are added to the modeled landscape instead of a more realistic gradual change over time. Since no projects were implemented in the later years (from year 26 through year 50), land area is decreasing at the end of the 50-year period in most regions. This indicates that there is not a restoration strategy that we can implement and then walk away from the coast. The Louisiana coast will require continuing investments in restoration projects throughout the 50-year plan period. The *2012 Coastal Master Plan* considered a more realistic implementation strategy than that depicted in this special issue. The *2017 Coastal Master Plan* will further improve our understanding of implementation strategies by testing variations in project sequencing and improving time steps to every 5 years.

(2) When all projects are operated simultaneously, sediment diversions have to share the sediment and freshwater resources of the river. The modeling maintained the threshold-based diversion operations as presented in the *2012 Coastal Master Plan*, and simplified the operations with a "first-come, first-served" approach. Therefore, sediment diversions lower on the river were less effective when operated simultaneously than when modeled individually due to the removal of sediment and freshwater higher in the system. This simplified operation strategy produces different results for land-building and other variables as presented in this special issue. The *2017 Coastal Master Plan* will test variations in operations to optimize the use of the river's sediment delivery potential and provide a more realistic outlook on how a system of sediment diversions may function into the future.

(3) Science is constantly evolving and it is important that CPRA incorporate the latest research into our efforts. Since Louisiana is so vulnerable to sea level rise, specific modeling was conducted to identify how sea level rise alone would affect our results. An additional scenario, termed Moderate with High Sea Level Rise, was introduced that increased eustatic sea level rise to 0.78 meters over 50 years while maintaining the Moderate Scenario level for all other uncertainties. This scenario is

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reported in this issue but was not discussed in the 2012 Coastal Master Plan. In most cases, as documented throughout this special issue, the results of the Moderate with High Sea Level Rise Scenario were very similar to the results of the Less Optimistic Scenario. The *2017 Coastal Master Plan* will test the sensitivity of our coastal landscape, as well as project outcomes, to all of the future uncertainties identified in the *2012 Coastal Master Plan* and incorporate the latest science and technical information to develop more refined future scenarios.

This special issue highlights the work of the *2012 Coastal Master Plan* modeling and Planning Tool teams. An overview manuscript is included to provide the reader with some background on the decision-making process and specific aspects, such as the future uncertainty scenarios, that are relevant to each of the subsequent manuscripts. The subsequent manuscripts each highlight one specific model, support tool, or model-related effort, in the case of the uncertainty analysis. The manuscripts will provide the reader with an understanding of the model or support tool's platform and mechanics, assumptions, limitations, and results. Additional information on all aspects of the *2012 Coastal Master Plan* modeling and decision-making process can be found at www.coastal.la.gov.

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ACKNOWLEDGMENTS

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We are grateful to all of the experts who contributed to this special issue, not only for authoring manuscripts but for the countless hours, late nights, and weekends they spent in development and production of the models and decision-support tools. We also wish to thank the dozens of independent, anonymous reviewers and editors who contributed to the peer review of the 2012 Coastal Master Plan technical appendix reports. Their suggested improvements along with the comments of 14 additional reviewers have improved the accuracy and understanding of the manuscripts presented herein. Special thanks to Alaina Owens of The Water Institute of the Gulf, who so effortlessly organized us all.

The technical analysis would not have been successful without the support of a few additional teams. We would like to thank Steven Ashby, John Callaway, Si Simenstad, and Fred Sklar for serving as members of the Predictive Modeling Technical Advisory Committee and John Boland, Ben Hobbs, and Len Shabman for serving as members of the Planning Tool Technical Advisory Committee. Their insight and expertise to the modeling and decision-support tools was integral to the effort. With so many data inputs and outputs changing hands, the effort would have failed if not for the Data Integration Team, which included Craig Conzelmann, Josh Bridevaux, Sumani Chimmula, Mark McKelvy, Dustin Roszell, Kevin Suir, and Christina Hunnicutt. Special thanks to members of the Barrier Shoreline Morphology team, including Mark Kulp, Ioannis Georgiou, Dallon Weathers, Duncan FitzGerald, and Zoe Hughes, whose time and effort were an important part of the systems approach.

The modeling effort was just one aspect of the 2012 Coastal Master Plan. We wish to acknowledge the hundreds of individuals who worked on all aspects of the 2012 Coastal Master Plan. Deep gratitude also goes to Garret Graves, the Governor's Assistant on Coastal Activities, Jerome Zeringue, Executive Director of CPRA, and Kyle Graham, Deputy Director of CPRA, who supported and invested in a science-based decision-making process and stood behind the team throughout the effort. William "Kirk" Rhinehart and Karim Belhadjali guided a Master Plan Delivery Team of nearly 50 individuals who worked tirelessly to ensure the accuracy and transparency of the process. Special thanks to Bill Dennison, Chip Groat, Greg Baecher, Ed Barbier, Phil Berke, Virginia Burkett, Robert Dalrymple, Jos Dijkman, Kathy Ewel, Ed Houde, and the late Mark Brinson, members of the Science and Engineering Board who critiqued, questioned, supported, and enhanced all aspects of our work, and to Robert Twilley for organizing their efforts. And last but not least, a big thanks to the members of the team from Brown and Caldwell, RAND Corporation, AC Writing, and SSA Consultants, whose endless dedication helped ensure a successful planning effort.

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THE COASTAL EDUCATION AND RESEARCH FOUNDATION

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Coconut Creek, FL 33073, U.S.A.

The Coastal Education and Research Foundation *[CERF]* is a nonprofit society dedicated to the advancement of the coastal sciences. The Foundation is devoted to the multi-disciplinary study of the complex problems of the coastal zone. The purpose of CERF is to help translate and interpret coastal issues for the public and to assist professional research and public information programs. The Foundation specifically supports and encourages field and laboratory studies on a local, national, and international basis. Through the medium of scientific publications, television, and radio CERF brings accurate information to the public and coastal specialists on all aspects of coastal issues in an effort to maintain or improve the quality of shoreline resources.

Because CERF is concerned with broad environmental issues, our efforts concentrate on significant problems such as maintenance of good quality (potable) water with adequate supply, and hazards associated with potential beach erosion, flooding, and susceptibility of developed shorelines to storm surge and wave attack. By focusing attention on these potential man-made and natural hazards, it is hoped that our research efforts will help others improve the quality of life in diverse coastal areas. CERF thus aims to stimulate awareness of coastal (marine and freshwater shorelines) land and water problems; initiate and foster research and innovation to promote long-term coastal productivity; establish an educational forum for the debate of contentious coastal issues; and develop new principles and approaches for enlightened coastal management, and encourage their adoption and use.

CERF is associated with the Department of Geosciences at Florida Atlantic University (FAU) in Boca Raton, Florida, and one of the main editorial offices for the *Journal of Coastal Research* (JCR) is located at the University. This partnership provides a basis for cooperative investigation, in private and public sectors, of biophysical resources found in open and naturally protected coastal regions, estuaries, large inland bodies of water bounded by shorelines, wetlands, and other coastal environments. Multidisciplinary studies at FAU's Department of Geosciences brings together experts from various fields in remote sensing, geographic information science, spatial ecology, environmental studies, marine biology, coastal geology, geography, and coastal engineering.

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Editor-in-Chief

Charles W. Finkl Ph.D., CSci, CMarSci, FIMarEST, CPGS, CPSSc, PWS

Dr. Charles W. Finkl is President and Executive Director of the Coastal Education & Research Foundation *[CERF]*, publisher of the JCR. Charlie, a founding editor of the *Journal of Coastal Research*, has served as Editor-in-Chief for the past 27 years. He is a Research Professor in the Department of Geosciences at Florida Atlantic University in Boca Raton, Florida. He received his Bachelor and Master of Science degrees from Oregon State University and the Ph.D. from the University of Western Australia. He is a member of more than 20 professional societies and has published more than 200 professional papers, books, and reports. He is a Chartered Marine Scientist (CMarSci) [Institute of Marine Engineering, Science and Technology], Certified Professional Geological Scientist (CPGS) [American Institute of Professional Geologists (AIPG),], Certified Professional Soil Scientist (CPSSc) [American Registry of Certified Professionals in Agronomy, Crops, and Soils], and a Professional Wetland Scientist (PWS) [Society of Wetland Scientists]. Charlie has field experience in parts of the USA, Caribbean area, Brazil, Honduras, Russia, South Africa, Western Europe, Australasia, and South Pacific islands. He is also the Series Editor of the Encyclopedia of Earth Sciences Series that is published by Springer (Germany). There are more than twenty-eight volumes in the Series and about twenty-five are available online. Charlie also serves on the Editorial Board of the *International Journal of Environmental Studies* (Routledge) and is an occasional peer reviewer for many other professional journals.

Charlie has interests and expertise in the general areas of surficial geology, coastal and marine geomorphology (including coastal classification), coastal/marine biophysical environments, exploration geochemistry, soils and weathering (regolith geology), coastal zone management and engineering applications or impacts on natural systems (including erosion control and shore protection), coastal hydrology including submarine freshwater and mineralized seeps, subaerial and marine structural geology, natural hazard mitigation in coastal zones, marine environments and coastal wetland protection and restoration, and remote sensing (*e.g.* land cover classification in coastal wetlands, advection-diffusion turbidity plumes in coastal waters, delineation of bottom types and sand resources), effluent disposal and pollution of wetlands and estuaries, water resources mapping and conservation, time series studies of wetland hydroperiod and soil moisture.

CERF Foundation Meetings

International Coastal Symposiums (ICS)

The International Coastal Symposium (ICS) was originally set up by Per Bruun (deceased) and Charlie Finkl as the official meeting of the Coastal Education & Research Foundation (CERF), with the first meeting being held in Hilton Head, South Carolina, in 1993. After the repeated success of these meetings, CERF moved the ICS to the international scene holding these conferences in conjunction with local sponsors in Australia, Brazil, Iceland, New Zealand, Northern Ireland, Poland and Portugal. The ICS brings together delegates from all over the world to collaborate and discuss the most current coastal research studies and projects. The ICS 2014, which is scheduled to be held from April 13–17 in Durban, South Africa, will be a grand celebration of CERF and the JCR, marking the 30th Anniversary for both. For more information, please visit www.cerf-jcr.org.