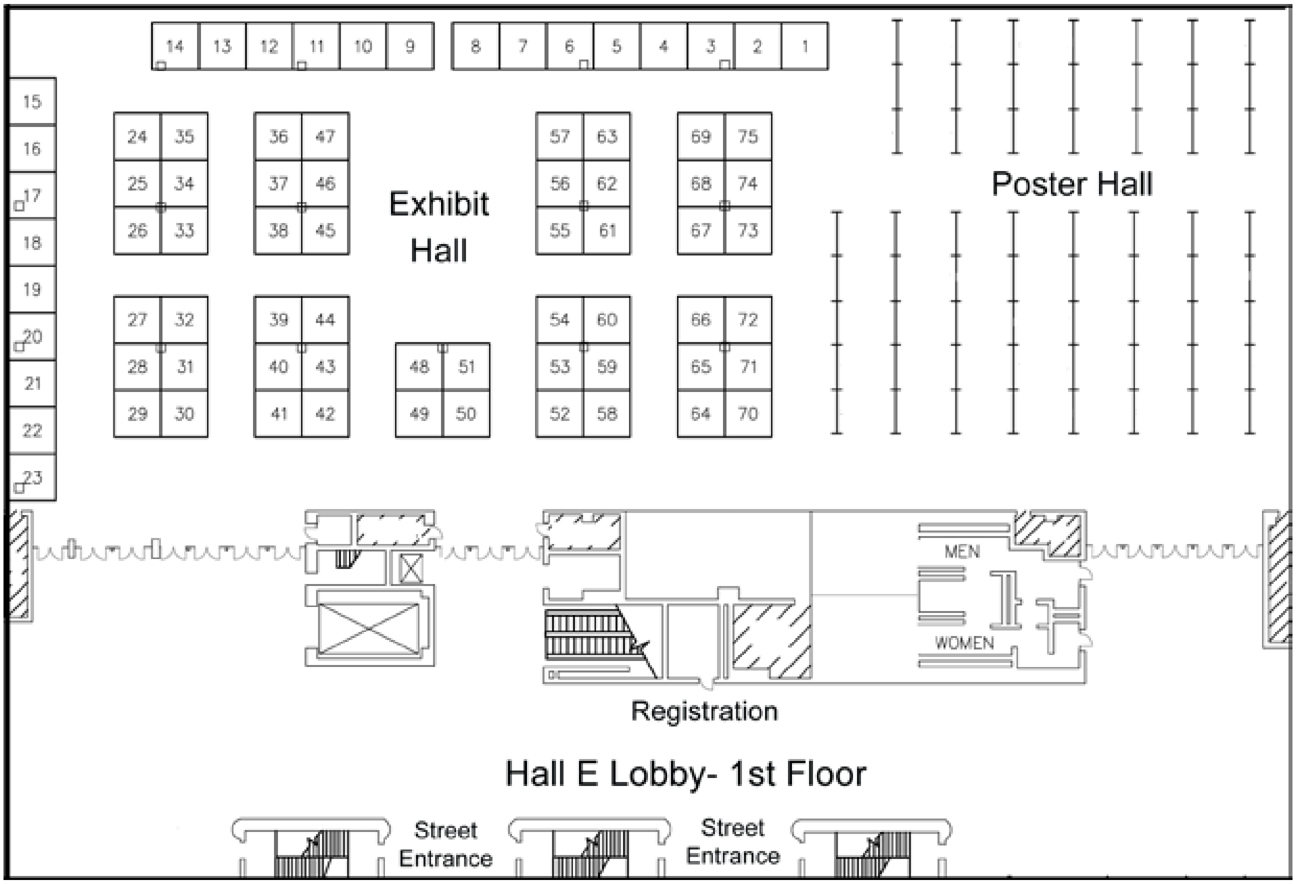
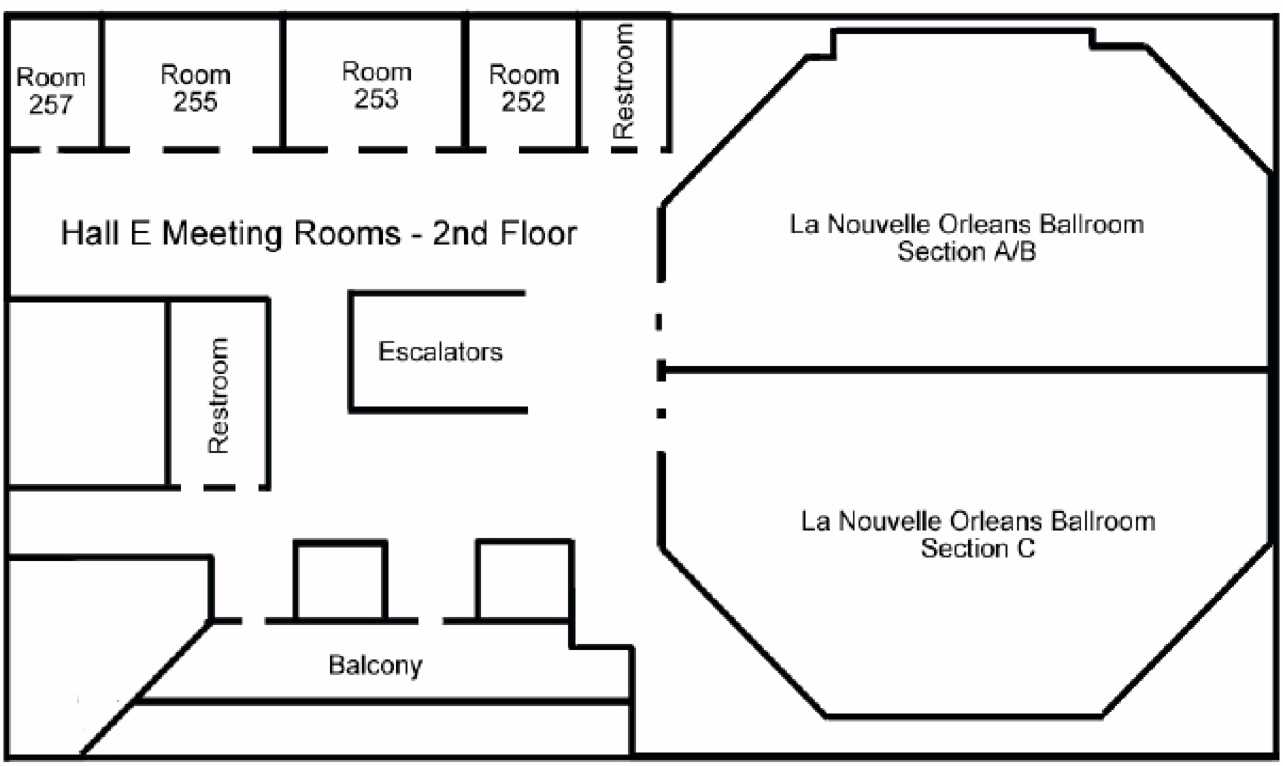
State of the Coast

Preparing for a Changing Future

June 25-27, 2012 | Morial Convention Center | New Orleans, LA

Facility Map





2012
State of the Coast Conference
Preparing for a Changing Future

June 25-27, 2012

New Orleans, LA

www.stateofthecoast.org

Contents

Conference Schedule

Monday, June 25, 2012

8:00-9:00 **Registration (Exhibit Hall E Lobby, 1st Floor)**

9:00-9:30 **Welcome Address (La Nouvelle Orleans, Ballroom C, 2nd Floor)**
Governor Bobby Jindal

9:30-10:00 **Break with Morning Refreshments in Poster/Exhibitor Hall (1st Floor)**

10:00-12:00 **Concurrent Session I (2nd Floor)**

Geospatial Data Resources and Applications (Room 257): Jim Mitchell, DOTD

10:05-10:30	The National Map - Base Geospatial Data for the Nation	Christopher Cretini *USGS*
10:30-10:55	Geodetic Resources in Louisiana and the Gulf Coast	Joshua Kent *Louisiana State University*
10:55-11:20	Analyzing Future Coastal Landscape Changes and the Threats to Critical Coastal Shore and Islands, Infrastructure and Communities	Timothy Osborn *NOAA*
11:20-11:45	Louisiana's Coastwide Reference Monitoring System (CRMS-Wetlands) Web Applications and Visualizations	Sarai Piazza *USGS*

Status and Future of Regional Programs (Room 255): David Muth, National Wildlife Federation

10:05-10:30	Coastal Impact Assistance Program (CIAP) - A Louisiana Success Story - Managing Coastal Projects	David Williams *Louisiana CIAP*
10:30-10:55	The Future of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA)	Brad Inman *US Army Corps of Engineers*
10:55-11:20	Louisiana Coastal Area (LCA) Near-Term Project Construction	Darrel Broussard *US Army Corps of Engineers*
11:20-11:45	Deepwater Horizon Oil Spill Natural Resource Damage Assessment: Restoring Louisiana's Injured Resources through Ecosystem Restoration Projects	Drue Banta *CPRA*

Barrier Islands and Shorelines I (Room 253): Michael Stephen, Coastal Engineering Consultants, Inc.

10:05-10:30	Barrier Islands Restoration in Louisiana- An Overview of Two Decades of Effort	Syed Khalil *CPRA*
10:30-10:55	Louisiana Barrier Island Restoration Performance Analysis	Michael Poff *Coastal Engineering Consultants, Inc.*
10:55-11:20	Grand Isle Barrier Shoreline Stabilization Study	Matthew Campbell *Coast Harbor Engineering, Inc.*
11:20-11:45	Measuring Back Barrier Marsh Restoration Success and Failure in Centimeters	Christine Pickens *University of Louisiana at Lafayette*

Near Shore Dynamics (Room 252): Q. Jim Chen, LSU

10:05-10:30	Numerical Simulation of Currents on the Louisiana Shelf	Mohammad Allahdadi *Louisiana State University*
10:30-10:55	Impact of Hydrodynamics on Colored Dissolved Organic Matter (CDOM) Distribution over the Louisiana-Texas Shelf: A Study Using Hydrodynamic Modeling and Ocean Color Data	Nazanin Chaichi *Louisiana State University*
10:55-11:20	Long-term Dynamics of Suspended Particulate Matter Along the Louisiana -Texas Coast from Satellite Observations	Eurico D'sa *Louisiana State University*
11:20-11:45	Modeling Strategy for the Development of a Mechanistic Model of Phytoplankton Growth in the Little Vermilion Bay	Barbara Benson *University of Louisiana at Lafayette*

12:00-1:30 **Lunch with Keynote Speaker Sponsored by Entergy (La Nouvelle Orleans, Ballroom A/B, 2nd Floor)**
Bill Mohl, President & CEO, Entergy Louisiana, LLC and Entergy Gulf States Louisiana, LLC.

1:30-3:00 **Concurrent Session II**

Topographic Mapping Applications (Room 257): John Brock, USGS

1:35-2:00	USGS-USACE-CPRA-NLCLDD Collaboration on Coastal Louisiana Airborne and Terrestrial Lidar Levee Acquisition Pilot Project	John Barras *USGS*
2:00-2:25	Mapping Levees in Lafourche Parish Louisiana Using High Resolution Mobile Terrestrial Lidar	Cindy Thatcher *USGS*
2:25-2:50	LADOTD Topographic Mapping Program - Building the Digital Geospatial Database of Louisiana	James Mitchell *DOTD*

Atchafalaya and Wax Lake Basin and Deltas I (Room 255): Clint Willson, LSU

1:35-2:00	Atchafalaya Basin Sediment Management Plan - Objective and Strategies	Anu Acharya *Arcadis*
2:00-2:25	Calibration of a Hydrodynamic Model of the Atchafalaya Basin to the 2011 Flood	Maarten Kluijver *Moffatt & Nichol*
2:25-2:50	Impacts of Large Flood Events on Sediment Dispersal Patterns and Channel Migration: Atchafalaya River, LA	F. Ryan Clark *Arcadis, US, Inc.*

Louisiana Coastal Area (LCA) Mississippi Hydrodynamic and Delta Management Feasibility Study (Room 253): Alisha Renfro, National Wildlife Federation

1:35-2:00	LCA Mississippi River Hydrodynamic and Delta Management Study Overview	Renee Sanders *CPRA*
2:00-2:25	LCA Mississippi River Hydrodynamic and Delta Management Study - Geomorphic Assessment of the Lower Mississippi River, Old River to the Gulf of Mexico	David Biedenharn *Biedenharn Group*
2:25-2:50	LCA Mississippi River Hydrodynamic and Delta Managment Study - One and Multi-Dimensional Modeling	Ehab Meselhe *The Water Institute of the Gulf*

Barrier Islands and Shorelines II (Room 252): Mark Hester, University of Louisiana at Lafayette

1:35-2:00	The Chandeleur Islands Oil Spill Mitigation Sand Berm: 1 Year Later	James Flocks *USGS*
2:00-2:25	Evaluation of Techniques to Enhance Plant Establishment at Barrier Island Dune and Swale Restoration Sites	Mark Hester *University of Louisiana at Lafayette*
2:25-2:50	Development of a Dynamic Sediment Budget to Predict Future Shoreline Positions on the Sand Limited Shoreline in Cameron Parish, Louisiana	Arpit Agarwal *Coast & Harbor Engineering, Inc*

3:00-3:30 **Break with Afternoon Refreshments in Poster/Exhibit Hall (1st Floor)**

3:30-5:00 **Concurrent Session III**

Landscape Restoration (Room 257): Eric Held, Ducks Unlimited

3:35-4:00	Coastal Planning in the United Kingdom	David Dales *URS*
4:00-4:25	Floodplain Conservation in the Mississippi River Valley – Combining Spatial Analysis, Landowner Outreach, and Market Assessment to Enhance Land Protection in the Atchafalaya River Basin, Louisiana	Jim Bergan *The Nature Conservancy*
4:25-4:50	Coastal Watershed Management: A Case Study Monitoring Bayou Teche	Whitney Broussard, III *University of Louisiana at Lafayette*

Hurricanes and Wetlands (Room 255): Amanda Moore, National Wildlife Federation

3:35-4:00	Wave Attenuation by Saltmarsh Vegetation in Terrebonne Bay during Tropical Storm Lee	Ranjit Jadhav *Louisiana State University*
4:00-4:25	Wetland Loss Associated with Hurricane Storm Surge Near the Caernarvon Freshwater Diversion	Pat Fitzpatrick *Mississippi State University*
4:25-4:50	Historical Hurricane Impacts on Coastal Wetlands: Contributions of Extreme Storms to the Development of the Coastal Louisiana Landscape Over the Past Century	John Barras *USGS*

Dredge Sediment Management (Room 253): Barbara Keeler, EPA Region 6

3:35-4:00	The Louisiana Coastal Area (LCA) Beneficial Use of Dredged Material (BUDMAT) and Demonstration Projects Programs, USACE Perspective	Robert Bosenberg *USACE*
4:00-4:25	Mississippi River Long Distance Sediment Pipeline: Opportunities and Constraints	Jonathan Hird *Moffatt & Nichol*
4:25-4:50	Riverine Sand Mining / Scofield Island Restoration Project (BA-40)	Jason Lanclos *CPRA*

Community Resiliency (Room 252): Happy Johnson, National Wildlife Federation

3:35-4:00	Governmental Laws, Rules and Policies; Are They Keeping Up With Coastal Restoration Objectives?	Kenneth Ammon *WRScompass*
4:00-4:25	How To Make a Resilient Gulf Coast	Valsin Marmillion *America's WETLANDS Foundation*
4:25-4:50	Achieving Stable Communities in an Unstable Landscape: The Louisiana Resiliency Assistance Program	Jeffrey Carney *Louisiana State University*

5:00-7:00 **Welcome Reception and Poster Session Sponsored by Hesco Bastion Environmental, Inc. (Poster/Exhibit Hall 1st Floor)**

Tuesday, June 26, 2012

7:30-8:30 **Registration (Exhibit Hall E Lobby, 1st Floor)**

8:30-10:00 **Concurrent Session IV**

Ecosystem Services (Room 257): Carol Parsons Richards, CPRA

8:35-9:00	Trajectory Economics: Dynamic Assessment of Ecosystem Service Flows from Coastal Land-Building Methods	Rex Caffey *Louisiana State University*
9:00-9:25	Estimating the Capacity of Louisiana Coastal Marshes to Support Foraging Waterfowl During Winter	Michael Brasher *Ducks Unlimited, Inc.*
9:25-9:50	Function and Diversity of the Ship, Trinity, and Tiger Shoal Complex, with Emphasis on Macroinfauna and Spawning Blue Crabs, *Callinectes sapidus*	Carey Gelpi *Louisiana State University*

2012 Louisiana Coastal Master Plan: Physical Processes and Impacts (Room 255): Denise Reed, UNO

8:35-9:00	Eco-Hydrology Modeling in Coastal Louisiana to Assess Project Effects on the Landscape	Ehab Meselhe *The Water Institute of the Gulf*
9:00-9:25	Storm Surge and Wave Modeling to Evaluate Coastal Restoration and Protection Projects for the 2012 Coastal Master Plan	Hugh Roberts *Arcadis*
9:25-9:50	Application of the Coastal Louisiana Risk Assessment (CLARA) Model to Predict Project Performance	Jordan Fishbach *RAND Corporation*

Sediment Transport (Room 253): Alex Kolker, Louisiana Universities Marine Consortium

8:35-9:00	West Bay Case Study: A Coastal Restoration Success with Policy Implications for Implementation of Future Land-Building Sediment Diversions	Mitch Andrus *Royal Engineers & Consultants, LLC*
9:00-9:25	Sediment Flux and Fate to Lake Pontchartrain from the Bonnet Carré Spillway in the 2011 Mississippi Flood	Samuel Bentley *Louisiana State University*
9:25-9:50	The Influence of Cold-Front Passages in Sediment Dispersal During Floods: Wax Lake Delta and Surrounding Marshlands	Harry Roberts *Louisiana State University*

Communicating Restoration Science (Room 252): Elizabeth “Boo” Thomas, Center for Planning Excellence

8:35-9:00	SciTEK: Blending Environmental Science with Traditional Ecological Knowledge	Mathew Bethel *Ponchartrain Institute for Environmental Studies*
9:00-9:25	The Evolution of Public Outreach in Wetland Restoration Ecosystems	Susan Testroet-Bergeron *CWPPRA*
9:25-9:50	Designing Institutions and Programs for Large Scale Ecosystem Restoration: Lessons Learned from the Great Lakes Experience	Michael Donahue *URS*

10:00-10:30 **Break with Morning Refreshments in Poster/Exhibitor Hall (1st Floor)**

10:30-12:00 **Concurrent Session V**

Coastal Protection (Room 257): Billy Wall, CPRA

10:35-11:00	Identifying Strategies to Reduce Flood Risk in New Orleans that are More Robust to Future Uncertainty	Jordan Fischbach *RAND Corporation*
11:00-11:25	The Ground is Moving - The Use of Wick Drains and Staged Construction in the Lake Pontchartrain and Vicinity (LPV) 109.02a Levee Construction over Very Soft Soils	John Volk *URS*
11:25-11:50	Coastal Structures & Sea Level Rise: An Adaptive Management Approach	John Headland *Moffatt & Nichol*

2012 Louisiana Coastal Master Plan: Landscape Response (Room 255): Natalie Snider, CPRA

10:35-11:00	Spatial Modeling of Land Change and Relative Elevation to Assess Restoration Priorities in Coastal Louisiana	Brady Couvillion *USGS*
11:00-11:25	Short-term Modeling of Coastal Response to Wave Climate and Relative Sea Level	Ioannis Georgiou *University of New Orleans*
11:25-11:50	Forecasting Vegetation Changes in Coastal Louisiana with LaVegMod	Jenneke Visser *University of Louisiana at Lafayette*

Atchafalaya and Wax Lake Basin and Deltas II (Room 253): Clint Willson, LSU

10:35-11:00	Sediment Deposition Patterns in a Prograding Delta as a Result of Mississippi/Atchafalaya River Spring Flood Discharge	Azure Bevington *Louisiana State University*
11:00-11:25	Sedimentation and Vegetation Community Change in the Wax Lake Delta Following the 2011 Mississippi River Flood	Melissa Vernon Carle *Louisiana State University*
11:25-11:50	The Effect of Climate and River Discharge on Interannual Variation in Aboveground Biomass of Delta Splays	David White *Loyola University*

Public Engagement (Room 252): Derek Brockbank, National Wildlife Federation

10:35-11:00	MRGO Must Go: A Coalition to Restore an Ecosystem	Amanda Moore *National Wildlife Federation*
11:00-11:25	Grassroots Community Involvement in Coastal Planning	Sharon Gauthe *BISCO*
11:25-11:50	Citizen Engagement for Coastal Management and Planning	Melanie Sand *University of New Orleans*

12:00-1:30 **Lunch with Keynote Speaker (La Nouvelle Orleans, Ballroom A/B, 2nd Floor)**
Dr. Charles “Chip” Groat, President, The Water Institute of the Gulf

1:30-3:00 **Concurrent Session VI**

Alternative Shoreline Protection (Room 257): Tyler Ortego, ORA Engineering, LLC.

1:35-2:00	Bio-Engineered Oyster Reef Demonstration Project	Josh Carter *Coast & Harbor Engineering*
2:00-2:25	Scaling Up Oyster Reef Restoration in Louisiana: Science-based Decision Support for Maximizing Project Success	Seth Blitch *The Nature Conservancy*
2:25-2:50	Flow Field Analysis of a HESCO® Delta® Unit Submerged Breakwater/Living Reef System	Craig Taylor *University of Minnesota*

Developing the 2012 Master Plan (Room 255): Kirk Rhinehart, CPRA

1:35-2:00	Decision Criteria Used in the Development of the 2012 Coastal Master Plan	Melanie Saucier *CPRA*
2:00-2:25	Applying a Planning Tool for the Louisiana Coastal Master Plan	David Groves *RAND Corporation*
2:25-2:50	Adaptive Management of Louisiana's Coastal Program	Natalie Snider *CPRA*

Lessons Learned (Room 253): Maura Wood, National Wildlife Federation

1:35-2:00	Determining the Performance of Breakwaters During High Energy Events: A Case Study of the Holly Beach Breakwater System	Andrew Woodroof *Louisiana State University*
2:00-2:25	Getting to the Roots of Successful Coastal Cypress Restoration	J.L. Whitbeck *Jean Lafitte National Park*
2:25-2:50	Rock, Weirs and Freshwater: A Look Back at Coastal Restoration Projects	Ron Boustany *NRCS*

Tools and Data for Local Stakeholder Engagement (Room 252): Susan Testroet-Bergeron, CWPPRA

1:35-2:00	Best Practices Manual for Development in Coastal Louisiana and Coastal Louisiana Land Use Toolkit	Camille Manning-Broome *Center for Planning Excellence*
2:00-2:25	Social-Ecological Mapping for Project Integration	Kristina Peterson *University of New Orleans*
2:25-2:50	Voter and Community Attitudes Toward the Mississippi River Delta and Louisiana's Coast: Implications for Building Political Will for Restoration and Sustainability	David Ringer *National Audubon Society*

3:00-3:30 **Break with Afternoon Refreshments in Poster/Exhibit Hall (1st Floor)**

3:30-5:00 **Plenary Session I**
Achieving More Sustainable and Balanced Management of the Lower Mississippi River

Wednesday, June 27, 2012

7:30-8:30 **Registration (Exhibit Hall E Lobby, 1st Floor)**

8:30-10:00 **Concurrent Session VII**

Socioeconomic Impacts of Hurricanes (Room 257): Rex Caffey, LSU

8:35-9:00	Forecasting Subsidence Across Louisiana's Coastal Plain: Challenges to Evacuation Resiliency	Joshua Kent *Louisiana State University*
9:00-9:25	Integrating Social Vulnerability into Multiple Lines of Defense Mitigation for Floods	Chris Emrich *University of South Carolina*
9:25-9:50	Forecasting Structure Development in Coastal Louisiana	Joseph Berlin *URS Corporation*

Delta Evolution (Room 255): Kurt Johnson, DOTD

8:35-9:00	New Chronological Data for Mississippi River- Mouth Shifting and Chenier Development: Do They Match?	Marc Hijma *Tulane University*
9:00-9:25	Predicting the Response of the Mississippi River Delta to Permanent Changes in Natural Processes	Erol Karadogan *Louisiana State University*
9:25-9:50	Incipient Formation of a New Distributary of the Mississippi River within the Bohemia Spillway, Southeast Louisiana	John Lopez *Lake Pontchartrain Basin Foundation*

Subsidence (Room 253): Angelina Freeman, Environmental Defense Fund

8:35-9:00	Subsidence Mechanisms and Rates Within and Beyond Coastal Louisiana: An Overview of Recent Progress	Torbjorn Tornqvist *Tulane University*
9:00-9:25	New Subsidence Curves for Northern Gulf of Mexico Tide Gauges and Their Implications for Coastal Restoration	Alexander Kolker *Louisiana University Marine Consortium*
9:25-9:50	Louisiana Coastal Zone Primary GPS Network Update	Stephen Estopinal *SJB Group, LLC*

Hydrodynamics (Room 252): Ehab Meselhe, The Water Institute of the Gulf

8:35-9:00	It's Not Your Father's RMA/TABS Model Anymore	Mark Johnson *FTN Associates, Ltd.*
9:00-9:25	Relative Impact of Highway Construction on Wetland Hydrology in Environmentally Sensitive Areas in Southeast Louisiana	Jeanne Arceneaux *C.H. Fenstermaker*
9:25-9:50	Examining the Teche-Vermilion Fresh Water Diversion Project as a Model for Other Diversion Projects	John Saichuk *LSU AgCenter*

10:00-10:30 **Break with Morning Refreshments in Poster/Exhibit Hall (1st Floor)**

10:30-12:00	**Concurrent Session VIII**		
	Marsh Vegetation (Room 257): Jenneke Visser, ULL		
	10:35-11:00	A 5-Year Mesocosm Study on 11 Species of Wetland Plants Common to Coastal Louisiana: The Effects of Water Quality, Hydrology, Sediment Addition, and Hurricanes on Above and Below Ground Production	Gary Shaffer *Southeastern Louisiana University*
	11:00-11:25	Using Artificial Neural Networks to Develop an Emergent Marsh Vegetation Community Classification System in Louisiana Coastal Wetlands: Application of Self-organizing Maps (SOMs)	Gregg Snedden *USGS*
	11:25-11:50	Environmental Constraints on the Establishment and Expansion of Three Species of Freshwater Tidal Marsh Macrophytes (*Schoenoplectus acutus, S. californicus* and *Typha latifolia*): Implications for Restoration	Taylor Sloey *University of Louisiana at Lafatyette*
	Productivity and Habitat (Room 255): Seth Blitch, TNC		
	10:35-11:00	A Spatially-explicit Individual-based Model of a Northern Gulf of Mexico Tidal Marsh Community: Applications for Evaluating Population- level Responses from Individual-level Effects	Shaye Sable *Dynamic Solutions, LLC*
	11:00-11:25	Assessing Optimal Salinity Levels for Nekton Assemblages in the Lower Barataria Estuary	Brian Alford *LDWF*
	11:25-11:50	An Oyster Habitat Suitability Index Model and its Application to Coastal Restoration in Louisiana	Thomas Soniat *University of New Orleans*
	Relative Sea-Level Rise I (Room 253): Jim Pahl, CPRA		
	10:35-11:00	Sea Level Rise and Tidal Impacts	Jay Ratcliff *US Army Corps of Engineers*
	11:00-11:25	Recommendations for Anticipating Sea-Level Rise Impacts on Louisiana Coastal Resources During Project Planning and Design	Kristin E. DeMarco *CPRA*
	11:25-11:50	Incorporating Sea-Level Rise Projections into Restoration Project Planning and Design	Jennifer Mouton *CPRA*
	Innovative Restoration Approaches (Room 252): Rick Raynie, CPRA		
	10:35-11:00	LaBranche Wetlands Restoration: Implementing Multiple Lines of Defense	Paul Tschirky *Moffat & Nichol*
	11:00-11:25	Canal Backfilling at the Barataria Preserve Unit, Jean Lafitte National Historical Park and Preserve, Louisiana	Haigler “Dusty” Pate *National Park Service*
	11:25-11:50	Innovative Coastal Restoration Tool Using Airplane and Airboat for Rapid Stabilization of Newly Created Marshes	Herry Utomo *LSU AgCenter*
12:00-1:30	**Lunch with Keynote Speaker (La Nouvelle Orleans, Ballroom A/B, 2nd Floor)** Dr. Susanne Moser, Director and Principal Researcher, Susanne Moser Research & Consulting		
1:30-3:00	**Plenary Session II (La Nouvelle Orleans, Ballroom C, 2nd Floor)** *A Sum Greater Than its Parts: Coordinating Restoration Interests in Louisiana*		
3:00-3:30	**Break with Afternoon Refreshments in Poster/Exhibit Area (1st Floor)**		

3:30-5:00 Concurrent Session IX

Deepwater Horizon Spill Studies (Room 257): Jason Shackelford, John Chance Land Surveys

3:35-4:00	Monitoring of the Louisiana Emergency Berm Project	Gordon Thomson *Coastal Planning and Engineering*
4:00-4:25	Numerical Modeling Study of Pulsed Diversion discharge on Salinity Distribution, Oil Slick Transport, and Fish Movement in the Breton Sound Estuary	Haosheng Huang *LSU*
4:25-4:50	Assessment of Body Size and Sex Ratios in Gulf Killifish (*Fundulus grandis*) from Sites in Barataria Bay, LA Impacted by the Deepwater Horizon Oil Spill	James Carr *Tulane University*

Myrtle Grove Modeling (Room 255): Brian Vosburg, CPRA

3:35-4:00	Myrtle Grove Delta Building Diversion: Field Surveys of Hydrodynamics and Sediment Transport in Lower Mississippi Near Myrtle Grove River Bend	Mead Allison *University of Texas*
4:00-4:25	Myrtle Grove Delta Building Diversion: Numerical Modeling of Hydrodynamics and Sediment Transport in Lower Mississippi Near Myrtle Grove River Bend	Ehab Meselhe *The Water Institute for the Gulf*
4:25-4:50	Basin Side Hydrodynamic And Morphological Modeling For The Delta Building Diversion At Myrtle Grove	Jeffrey Shelden *Moffatt & Nichol*

Relative Sea-Level Rise II (Room 253): Jim Pahl, CPRA

3:35-4:00	Implications of Long-term Water Level Variations for Coastal Marsh Sustainability	John Day *Louisiana State University*
4:00-4:25	Anticipating Coastal Community Habitat Changes and Implications for Developing Ecological Restoration and Management Measures That Accommodate Resiliency	Ed Morgereth *Biohabitats*
4:25-4:50	Planning for Inland Migration of Coastal Wetlands Due to Sea Level Rise in Louisiana	Alicia Bihler *Duke University*

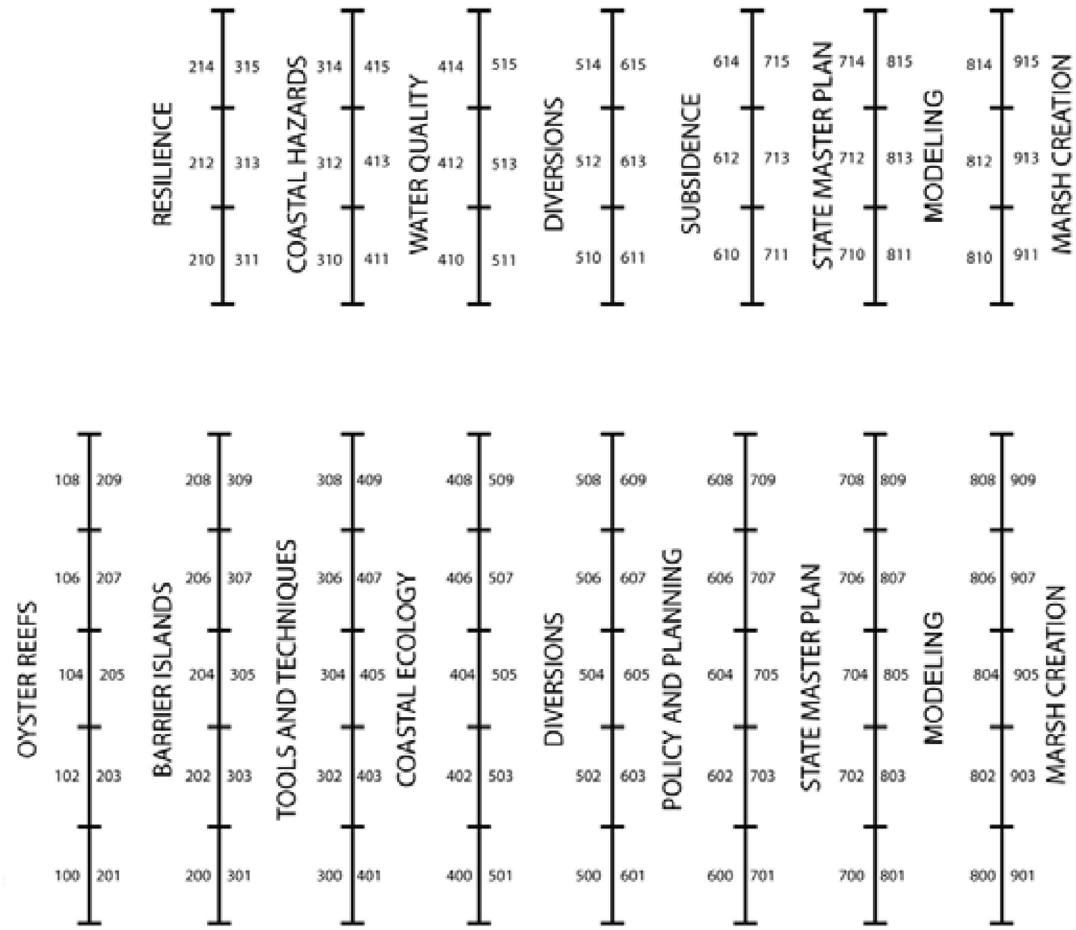
Conceptualizing the Future of Coastal Louisiana (Room 252): Elizabeth English, University of Waterloo

3:35-4:00	Independent External Peer Review Critiques of Adaptive Management Plans for Large Scale Ecosystem Restoration Projects	Julian DiGialleonardo *Battelle Memorial Institute*
4:00-4:25	It's Much More Than a Pretty Picture - The Benefits of Adding Illustrative Master Plans to the Ecosystem Restoration Tool Box	Georganna Collins *Ecology and Environment, Inc.*
4:25-4:50	World-class Visions for a Self-Sustaining Delta Landscape	Brian Jackson *Environmental Defense Fund*

Professional Development Hours

Professional Development Hours are a means to account for continuing professional education oftentimes necessary for license or other certification renewal. For attending professionals wishing to earn PDHs, whether teachers or engineers, the State of the Coast Conference is a valuable way of earning credit. Attendees will receive 0.5 PDH per session and speakers will receive 1 PDH for their presentation as approved by their respective crediting entity. As a value-added service, attendees can receive a PDH Log form upon request at the registration desk to assist in tracking their acquired PDHs. Attendees may also download and print a .pdf of the log in advance of the conference from the website www.stateofthecoast.org.

Poster Presentations



2012 Revision to the State's Master Plan Planning

712 **Incorporating Nonstructural Alternatives in Large-Scale Protection and Restoration Plans – Louisiana's 2012 Coastal Master Plan**
Michele Deshotels, CPRA

713 **Outreach, Engagement, and Review for Louisiana's 2012 Coastal Master Plan**
Melanie Saucier, CPRA

714 **Cultural Heritage Decision Criteria Used in the Development of the 2012 Coastal Master Plan**
Joe Wyble, Brown and Caldwell

715 **Louisiana's 2012 Coastal Master Plan: Envisioning Our Coastal Future**
Andrea Galinski, CPRA

2012 Revision to the State's Master Plan Technical Analysis

700 **Uncertainty Analysis of the Models Used to Inform Louisiana's 2012 Coastal Master Plan**
Emad Habib, ULL

701 **A Landscape-Level Modeling Analysis of the Potential Role of Wetlands as Sink of Inorganic Nitrogen in Support of the 2012 Coastal Master Plan**
Victor Rivera-Monroy, Department of Oceanography and Coastal Sciences, Louisiana State University

702 **Nature-Based Tourism and Storm Surge/Wave Attenuation Models Used to Inform the 2012 Coastal Master Plan**
Ross Del Rio, University of New Orleans

703 **A Crawfish Habitat Suitability Index Model in Support of Louisiana's 2012 Coastal Master Plan**
Robert Romaire, Aquaculture Research Station, Louisiana State University

704 **Predicting the Effects of Hurricane Protection and Wetland Restoration Projects on American Alligators, Muskrats, and River Otters**
Andy Nyman, School of Renewable Resources, Louisiana State University

705 **A Largemouth Bass (*Micropterus salmoides)* Habitat Sustainability Model in Support of Louisiana's 2012 Coastal Master Plan**
Michael Kaller, School of Renewable Resources, Louisiana State University

706 **Integrating and Visualizing Upper Trophic and Ecosystem Service Model Output in Support of the 2012 Coastal Master Plan**
Carol Parsons Richards, CPRA

707 **Overview of the Upper Trophic Level Modeling Used to Support Louisiana's 2012 Coastal Master Plan**
Carol Parsons Richards, CPRA

708 **Remotely Sensed Analysis of Marsh Collapse Thresholds in Coastal Louisiana**
Holly Beck, Five Rivers Services, Inc.; USGS

709 **Environmental Scenarios Considered in the 2012 Coastal Master Plan Technical Analysis**
Alaina Owens, Brown and Caldwell

711 **Project Attribute Development for Large Scale Coastal Protection and Restoration Projects in the 2012 Coastal Master Plan**
Brett McMann, Brown and Caldwell

Barrier Islands

200 **State of the Barataria/Plaquemines Barrier Shoreline**
Summer Langlois, CPRA

201 **Modeling the Response of a Beach Restoration Project in Louisiana to Two Consecutive Hurricanes**
Naveen Khammampati, Department of Civil and Environmental Engineering, Louisiana State University

202 **EPA's Barrier Island Restoration Work in Louisiana**
Ken Teague, EPA

203 **Status of the Timbalier Island Dune/Marsh Restoration (TE-40) Project**
Patricia Taylor, EPA

204 **Whiskey Island Back Barrier Marsh Creation**
Brad Miller, CPRA

205 **Louisiana Barrier Island/Headland Restoration – Construction Status and Lessons Learned on the West Belle Pass Restoration Project**
Phillip Parker, NOAA Fisheries

206 **Service Delivery and Supply for East Grand Terre Island Restoration**
Aaron Pierce, Resource Environmental Solutions, LLC

207 **Scofield Island Louisiana Ecosystem Restoration**
Kenneth Bahlinger, CPRA

209 **Design and Permitting of the Caminada Headland Beach and Dune Restoration Project**
Joseph Guillory, Coastal Protection and Restoration Authority

Coastal Ecology

400 **Timothy canarygrass *(Phalaris angusta)* Response to Seawater Intruded Soil Remediation**
Jessica Hargrave, Tulane University
Student Poster

401 **Timothy Canarygrass *(Phalaris angusta)* Response to Circulating Fluidized Bed Ash Particle Size**
David Kee, McNeese State University

402 **How does Timothy Canarygrass Compare to Annual Ryegrass?**
Chris Brown, Department of Agriculture, McNeese State University
Student Poster

403 **The Effect of Freezing and Salinity on *Avicennia germinans* Survival and Biomass**
Adam Constantin, University of Louisiana at Lafayette
Student Poster

404 **Combatting the Threat of Aquatic Invasive Species in Large Ecosystems: An Emerging Framework for Rapid Response**
Michael Donahue, URS Corporation

405 **Study of Recalcitrance in *Spartina alterniflora* Seeds for Coastal Restoration in Louisiana**
Yi Wang, Louisiana State University AgCenter
Student Poster

406 **Effects of Storage Environment on Sea Oats Seed Germination**
Nabukalu Pheonah, Louisiana State University AgCenter
Student Poster

407 **Hydrological Responses of Hummocks and Hollows to Episodic Rainfall in a Baldcypress Forested Wetland**
Yu-Hsin Hsueh, School of Renewable Natural Resources, Louisiana State University
Student Poster

408 **Coastal Habitat Use by Intercontinental Migratory Landbirds During Spring Stopover within an Urbanized Landscape**
Jill Gautreaux, University of Southern Mississippi
Student Poster

409 **Effects Hurricane Disturbance on the Habitat Relations of Migratory Passerines in a Louisiana Chenier**
Emily Lain, University of Southern Mississippi

411 **Daily Movements of Female Mallards Wintering in Southwestern Louisiana**
Paul Link, LDWF

413 **Use of Habitats by Female Mallards Wintering in Southwestern Louisiana**
Paul Link, LDWF

415 **Evaluating Barrier Island Habitats for Wintering Waterbirds**
David Curtiss, Nicholls State University
Student Poster

Coastal Hazards and Pollution

208 **Collaborative Gulf Science: Improving Scientific Understanding and Preparedness for Disaster Response and Climate Change**
Christopher D'Elia, LSU, Coastal Policy and Planning

309 **Cataloging All Available Storm Surge Measurements for the State of Louisiana: The National Storm Surge Database**
Katie Peek, Western Carolina University

310 **A Review of Hurricane Surge Hazard Analysis for Southeast Louisiana**
Bob Jacobsen, Southeast Louisiana Flood Protection Authority -East

311 **Simulation of Waves and Surge in Terrebonne Bay During Tropical Storm Lee**
Kelin Hu, Louisiana State University

312 **Greater New Orleans Hurricane Storm Damage Risk Reduction System**
James McMenis, CPRA

313 **Modeling Spilled-Oil Transport under Normal and Extreme Weather Conditions**
Ke Liu, Louisiana State University
Student Poster

314 **Effects of Coastal Highways and Levees on Wave Action and Oil Spill Contamination**
Ning Zhang, McNeese State University

315 **Effects of the Deepwater Horizon Oil Spill on Migratory Shorebirds**
Jessica Henkel, Tulane University
Student Poster

Policy and Planning

600 **Findings of the Science and Engineering Special Team on Sustainable Restoration of the Mississippi Delta**
Angelina Freeman, Environmental Defense Fund

601 **Louisiana Coastal Restoration & the Louisiana Coastal Area (LCA) Projects, US Army Corps of Engineers Perspective**
Mark Wingate, USACE

602 **Guidance for the Use of Restoration of Degraded Deltaic Wetlands of the Mississippi Delta American Carbon Registry Modular Methodology**
Sarah Mack, Tierra Resources

603 **A GIS to Restore Marsh from Oil Industry Canals on Public lands in Louisiana's Delta Plain**
Scott Eustis, Gulf Restoration Network

604 **Backfilling Canals For Restoration of Louisiana Coastal Wetlands - Why Aren't We Doing It?**
Ken Teague, EPA

605 **4-H Youth Wetlands Education and Outreach Program: The Importance of Youth-Adult Partnerships in Wetland Education and Conservation**
Ashley Mullens, Louisiana State University AgCenter

606 **Restoring Bayou Bienvenue**
Darryl Malek-Wiley, Sierra Club

607 **The Impact of Coastal Restoration Projects on Recreation**
Joseph Berlin, URS Corporation

608 **Southwest Coastal Louisiana Feasibility Study Overview**
Stephanie Zumo, CPRA

609 **Jefferson Parish: Wetlands Zoning Study**
Rob Delaune, Digital Engineering and Imaging, Inc.

710 **Utilizing the Existing Science, Monitoring, and Adaptive Management Framework from Louisiana's Master Plan to Inform Implementation of the Gulf of Mexico Regional Restoration Strategy**
Alyssa Dausman, U.S. Geological Survey

Coastal Resilience

210 **Creating Coastal Resilience through Job Creation**
Irit Tamir, Oxfam America

212 **Temporal Changes of Coastal Community Resilience in the Gulf of Mexico Region**
Kenan Li, Louisiana State University
Student Poster

214 **The Coastal Marine Institute at Louisiana State University**
Susan Welsh, Louisiana State University

Diversions: Science, Design, and Performance

500 **Mississippi River Reintroduction into Bayou Lafourche Project, Ascension and Assumption Parishes, Louisiana**
Earl Paddock, Coastal Protection and Restoration Authority

501 **Long-term Suspended Sediment and Deposition Dynamics of the Atchafalaya River Basin**
Timothy Rosen, School of Renewable Natural Resources, Louisiana State University

502 **Investigating the Technical Issues Associated with the Construction and Operation of River Diversions in the State of Louisiana**
Dawn Davis, CPRA

503 **Reintroduction of Mississippi River Water Into Deltaic Plain Wetlands: the EPA/CPRA Projects**
Ken Teague, EPA

504 **Bed-Material Transport Dynamics over Lateral Sand Bars in the Vicinity of Myrtle Grove**
Michael Ramirez, University of Texas
Student Poster

505 **Comparing Newly Building Wetlands in the Atchafalaya Bay, Louisiana and the Sacramento-San Joaquin Delta, California**
Lindsay Dunaj, University of New Orleans
Student Poster

506 **Estuarine Ecosystem Response to Three Large-Scale Mississippi River Flood Diversion Events**
Eric Roy, Louisiana State University

507 **Evidence of Marsh Building in the Coastal Chenier Plain in Southwest Louisiana, a Century of Coastal and Riverine Processes at Work**
Cyndhia Ramatchandirane, Tulane University
Student Poster

508 **Hydrodynamics and Sediment Dynamics in the West Bay Mississippi River Diversion**
Alex Kolker, LUMCON

509 **LCA Mississippi River Hydrodynamic and Delta Management Study – One and Multi Dimensional Modeling**
Ehab Meselhe, The Water Institute of the Gulf

510 **LCA Mississippi River Hydrodynamic and Delta Management Study - Field Observational Studies of Hydrodynamics and Sediment Transport in Lower Mississippi River**
Mead Allison, University of Texas

511 **Louisiana Coastal Area (LCA) Medium Diversion at Myrtle Grove with Dedicated Dredging**
Micaela Coner, CPRA

512 **Rehabilitation, Modification, and Expansion of the Small Scale Physical Model**
Molly Bourgoyne, CPRA

514 **Grain-size Analysis and Sediment Trapping Efficiency of the Attakapas Crevasse Splay: Implications for Coastal Restoration in the Mississippi River Delta**
Jonathan Marshak, Tulane University
Student Poster

Marsh Creation

901 **East Marsh Island Marsh Creation**
Brad Miller, CPRA

903 **Sediment Mining the Mississippi River for Marsh Creation: Bayou Dupont and Lake Hermitage**
Brad Miller, CPRA

905 **Analysis of Marsh Revegetation Efforts in Calcasieu and Cameron Parishes, Louisiana**
Joshua Soileau, McNeese State University
Student Poster

907 **The Sabine Refuge Marsh Creation – Cycle 2 Project**
William Feazel, CPRA

909 **Status of the Mississippi River Sediment Delivery System – Bayou Dupont (BA-39) Marsh Creation Project**
Paul Kaspar, EPA

911 **Estimating Settlement for Coastal Fill Projects**
David Eley, GeoEngineers, Inc.

913 **Thin-layer Sediment Nourishment of a Brackish Marsh With Organic Soil: a Cautionary Tale With a Happy Ending**
Sean Graham, Department of Oceanography and Coastal Sciences, Louisiana State University

915 **Rabbit Island Restoration**
Benjamin Richard, Tetra Tech

Oyster Reefs / Shoreline Protection

100 **The Influence of Tidal Height and Wave Energy on First-Year Oyster Reef Development on Constructed Shoreline Erosion Control Structures**
Daniel O'Malley, Nicholls State University
Student Poster

102 **Biologically Dominated Intertidal Breakwaters as Artificial Oyster Reefs for Coastal Protection**
J.D. Risinger, Louisiana State University

104 **Increasing Resiliency of Coastal Habitats with Oyster Reef Restoration Projects**
Seth Blitch, The Nature Conservancy

106 **A Comparison of Fish and Macroinvertebrate Communities Associated With Constructed Oyster Reefs and Natural Oyster Reefs in a Louisiana Estuary**
Victoria Bacheler, Nicholls State University
Student Poster

108 **Marsh Restoration and Repairs to Shoreline Protection Systems Along the Houston-Galveston Navigation Channel by the U.S. Army Corps of Engineers – Galveston District Using a Multiple Award Task Order Contract (MATOC)**
Gerald Hauske, HDR Engineering, Inc.

Physical and Biological Modeling

800 **Development of a Non-Hydrostatic Model for Simulation of Nonlinear Waves over Submerged Vegetation**
Ling Zhu, Louisiana State University
Student Poster

801 **Simulation of Wave Attenuation by Fluid Mud Using a Finite-Volume Navier-Stokes Model**
Qi Fan, Department of Civil and Environmental Engineering, Louisiana State University
Student Poster

802 **Laboratory Investigations of Wave Attenuation Variation through Natural Emergent Vegetation**
Agnimitro Chakrabarti, Louisiana State University

803 **Relationships between Turbidity and Bottom Shear Stresses in Terrebonne Bay, Louisiana**
Arash Karimpour, Louisiana State University

804 **Expanding your Numerical Modeling Toolbox: Smoothed Particle Hydrodynamics (SPH) and Applications to Coastal Restoration in Louisiana**
Erin Rooney, HDR Engineeering, Inc.

805 **Predicting Long Term Morphological Change**
Adrian Wright, URS, Basingstoke, UK

806 **Lake Charles Hydrodynamics and Sediment Study**
Ning Zhang, McNeese State University

807 **An Immersed-Boundary Method for 1-D and 2-D Coupling in Hydrodynamic Simulations**
Ning Zhang, McNeese State University

808 **Measurement of Unsteady Water-Surface Elevation in Lake Charles Using GPS Depth Finder**
Puxuan Li, McNeese State University
Student Poster

809 **A New SH-Wave Electrical-Mechanical Generator for Near Surface (0-30m) Seismic Studies**
James Crane, Louisiana State University

810 **Sediment Concentration and Deposition Measurements in Calcasieu Ship Channel and Surrounding Waters**
Puxuan Li, McNeese State University
Student Poster

811 **Remote Coastal Monitoring in Southwest Louisiana**
Paul Bender McNeese State University

812 **Evaporation as a Factor in Coastal Wetland Forest Hydrology**
April Newman, Louisiana State University AgCenter

813 **Phytoplankton Water Quality and Light Dynamics in Little Vermilion Bay, Implications for Mechanistic Modeling**
Ruwaida Bari, ULL
Student poster

814 **Challenges and Benefits from the First Six Years of Implementing Louisiana's Coastwide Reference Monitoring System-Wetlands (CRMS-Wetlands)**
Donna Weifenbach, CPRA

815 **Development of a Forested Floristic Quality Index Tool for the Coastwide Reference Monitoring System-Wetlands**
Bernard Wood, CPRA

Subsidence, Sea Level Rise, and Land loss

610 **A Decade of Wetland-Loss Research at the USGS: Quantifying Trends, Processes, and Large-Scale Historical Accommodation Formation in Coastal Louisiana**
John Barras, USGS

611 **Horizontal and Vertical Variability in Soil Bulk Density and Organic Matter Across Coastal Louisiana Wetlands Detected by the Coast-wide Reference Monitoring System (CRMS - Wetlands)**
Hongqing Wang, USGS

612 **Submergence Vulnerability Index Tool for the Coastwide Reference Monitoring System-Wetlands - Index Development and Preliminary Trends**
Leigh Anne Sharp, CPRA

613 **Tectonic Components of Subsidence in the Mississippi Delta**
Torbjorn Tornqvist, Tulane University

614 **Field Observations of Marsh Edge Retreat and Wind Waves**
Kyle Parker, Louisiana State University
Student Poster

615 **Mississippi Delta Marsh Tipping Points Linked to a Holocene Sea-Level Record and Implications for Future Coastal Marsh Sustainability**
Krista Jankowski, Tulane University

Tools and Techniques of Restoration

300 **Louisiana State University Agricultural Center Releases Three Smooth Cordgrass Varieties for Saline Marsh Restoration Projects**
Carrie Knott, Louisiana State University AgCenter

301 **Vegetative Releases for Barrier Island, Marsh and Estuary Restoration for South Louisiana**
Garret Thomassie, USDA

302 **Developing Innovative Coastal Restoration Tools Through Seed-based Planting and Coated or Tableted Seed**
Ida Wenefrida, Rice Research Station, Louisiana State University

303 **Establishment Techniques for *Baccharis halimifolia* at Coastal Restoration Sites**
Michael Dupuis, Coastal Plant and Ecology Laboratory, ULL

304 **Range-Finding Studies to Optimize Use of Commercially-Prepared Humic Acid for the Enhancement of Barrier Island Planting Success**
Jonathan Willis, University of Louisiana

305 **More Biomass and Diversity from Inexpensive Wetland Propagation**
Brian Heynen, Northern Illinois Resource Solutions

306 **Regenerative Stream Conveyance (RSC) as an Approach to Restoration of Ecosystem Services**
Joe Berg, Biohabitats, Inc.

307 **WaveRobbers™: Erosion Control and Land Reclamation**
Scott LeBlanc, University of Louisiana at Lafayette

308 **The Coastal Restoration Module**
Matt Hahne, Resolve Marine Group, Inc.

Water Quality

410 **Recently Observed Seasonal Hypoxia in Eastern Louisiana within Chandeleur Sound and Near Coastal Mississippi within the Gulf of Mexico**
Theryn Henkel, Lake Pontchartrain Basin Foundation

412 **Are River Corridor Wetlands Effective Sinks for Nitrate? Results from the Record 2011 Spring Flood of the Mississippi River**
April Bryant-Mason, School of Renewable Natural Resources, Louisiana State University
Student Poster

414 **Metabolism of Nitrogen and Phosphorus in an Urbanizing Coastal Louisiana Watershed and Projected Scenarios for Sustainable Development**
Eric Roy, Louisiana State University
Student Poster

513 **Cocodrie Swamp Water Quality Project: Consensus Building for Flow and Sediment Management within the Lower Atchafalaya Basin Floodway**
Aaron Nickolotsky, Southern Illinois University
Student Poster

515 **Seasonal Patterns of Denitrification and Nutrient Fluxes in Coastal Marshes of a Prograding Delta, Wax Lake**
Edward Castaneda-Moya, Department of Oceanography and Coastal Sciences, Louisiana State University

Thanks to our State of the Coast Committee Members

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- Steven Peyronnin, Coalition to Restore Coastal Louisiana
- Rick Raynie, Coastal Protection and Restoration Authority
- Denise Reed, PhD, The Water Institute of the Gulf
- John Ettinger, Environmental Protection Agency
- Clint Willson, PhD, Louisiana State University
- David Muth, National Wildlife Federation
- Mark Wingate, US Army Corps of Engineers
- Janet Woolman, McNeese State University
- Jeff Duplantis, MWH Global
- Mark Morgan, SEMS Inc.
- Kurt Evans, Digital Engineering and Imaging, Inc.
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Welcome Address

Monday, June 25 9:00-9:30

Governor Bobby Jindal

(invited)

Join us upstairs in the La Nouvelle Orleans Ballroom as we kick off State of the Coast 2012, the largest forum ever assembled on the topic of Louisiana coastal land loss.

Our invited guest speaker for the welcoming address is Louisiana Governor Bobby Jindal. Currently in his second term as governor (initially elected in 2008), Jindal has also served Louisiana on the federal level, as a member of the U.S. House of Representatives from 2005-08. Jindal has led the state's response to two of its most recent coastal crises, Hurricane Gustav in 2008 and the Deepwater Horizon disaster of 2010.

Concurrent Session I

Monday, June 25 10:00-12:00

Geospatial Data Resources and Applications (Room 257)

Moderator: Jim Mitchell, DOTD

The National Map - Base Geospatial Data for the Nation

Christopher Cretini[1]

[1] *US Geological Survey, NSDI Partnership Office, 700 Cajundome Blvd., Lafayette, LA 70506*

As one of the cornerstones of the US Geological Survey's (USGS) National Geospatial Program, The National Map is a collaborative effort among the USGS and other Federal, State, and local partners to improve and deliver topographic information for the nation. It has many uses ranging from recreation, to scientific analysis, to emergency response. The National Map is easily accessible for display on the Internet, as products and services, and as downloadable data. The geographic information available from The National Map includes orthoimagery (aerial photographs), elevation, geographic names, hydrography, boundaries, transportation, man-made structures, and land cover. The National Map is a significant contribution to the National Spatial Data Infrastructure (NSDI) and currently is being transformed to better serve the geospatial community by providing high quality, integrated geospatial data and improved products and services including the US Topo, the next generation of digital topographic maps from the USGS.

Arranged in the traditional 7.5-minute quadrangle format, digital US Topo maps are designed to look and feel like the traditional paper topographic maps for which the USGS is well known. At the same time, US Topo maps provide modern technical advantages that support wider and faster public distribution and enable basic, on-screen geographic functions for all users. US Topo users can turn geographic data layers on and off as needed; zoom in and out to highlight specific features or see a broader context; and print the maps, in their entirety or in customized sections. Additional analytical tools are available free for download. Download links and a user guide are featured on the US Topo Web site. File size for each digital 7.5-minute quadrangle, about 15-20 megabytes, is suitable for most users. As the US Topo evolves, the USGS is scanning all scales and all editions of approximately 200,000 published maps since the inception of the topographic mapping program in 1884. This scanning and processing effort serves the dual purpose of creating a master catalog and digital archive copies of the irreplaceable collection of topographic maps in the USGS, as well as making the maps available for viewing and download.

Implications

The base geospatial data, products, and services that comprise *The National Map* are used to study changes in landform, elevation, vegetation and wildlife habitat, and water resources, all of which are used to plan, implement, and monitor the impacts of coastal restoration. Partners and other organizations produce and maintain a vast array of high-quality geospatial data. A significant objective of the USGS National Geospatial Program is to continue improving these assets through mutually beneficial partnerships that ensure the availability of current, accurate base geospatial data consistent with principles of the National Spatial Data Infrastructure (NSDI). Promoting the development and sharing of geospatial data throughout all levels of government, the private and non-profit sectors, and the academic community will enable better policy and land management decisions and improve base maps and data for coastal restoration programs.

Geodetic Resources in Louisiana and the Gulf Coast

Joshua D. Kent[1]*, Cliff Mugnier*[1]*, Randy Osborne*[1]*, Larry Dunaway*[1]

[1] *Louisiana State University, Center for GeoInformatics, 219 Engineering Research & Development Bldg., South Stadium Drive, Louisiana State University, Baton Rouge, LA 70803*

It is well documented that Louisiana is subsiding with respect to the Gulf of Mexico. In addition, to increasing the region's vulnerability to hurricanes, storm surge, and global sea level rise, subsidence has destroyed the traditional system of vertical control benchmarks upon which the public and the State's infrastructure have come to rely. Through partnerships with public, private, and academic sectors, the Center for GeoInformatics (C4G) at Louisiana State University (LSU) has improved the availability and quality of geodetic resources in Louisiana. These provide reliable access to accurate and precise elevation data for any location across the state.

Central to this effort is the C4GNet, real-time network (RTN), a state-of-the-art network of more than 65 global positioning system antennas and receivers situated in and around Louisiana. This network of Continuously Operating Reference Stations (CORS) represents the 21st Century equivalent of the nation's geodetic monument-based reference system by providing real-time kinematic corrections for global positioning and global navigational satellite systems (e.g., GPS and GNSS). Of these stations, 27 participate in the National Spatial Reference System (NSRS), which is maintained by the National Geodetic Survey (NGS). By making these resources accessible through the NGS, the public and private sectors are able to leverage the ultra-precise positioning made possible by the CORS network. Because subsidence has caused nearly all of the traditional benchmarks to be decertified, C4GNet is the only reliable source of elevations available to the surveyor, engineer, architect, land manager, and farmer in the state of Louisiana and must be used, according to state law (La. R. S. 50:173.1, "Vertical control standards").

The C4G's contributions to ongoing research and investigation of contemporary subsidence in coastal Louisiana are unmatched. Beginning in 2002, the C4G established the Louisiana Spatial Reference Center (LSRC) to provide technical leadership, training, and access to the resources and capabilities made possible by the CORS network. Accordingly, C4G was selected by the Louisiana Department of Transportation and Development (LADOTD) to measure the 3-D positions of officially designated flood protection levees in coastal Louisiana. In 2008, the C4G partnered with the National Weather Service (NWS), the LADOTD, and U.S. Army Corps of Engineers to update elevation measurements for improved accuracy of storm surge models developed for the SLOSH modeling platform. Current research includes an examination of the long-term impact of subsidence and global climate change on emergency evacuation routes in coastal Louisiana.

This presentation will describe the services and data available at C4G and the Louisiana Spatial Reference Center. Information on will be provided on how these resources can be accessed. In addition, examples of applications using the spatial data resources at C4G will be described.

Implications

With traditional vertical control decertified and made useless by subsidence, the C4GNet provides state of the art horizontal and vertical precision. This provides improved accuracy, faster data collection, ensures a single geodetic standard for all stakeholders, and establishes a Gulf-wide geospatial framework for research, infrastructure design and protection, and long-term community resiliency. C4GNet creates the ability to detect and measure change, with tangible results that impact broad segments of Louisiana's coastal communities. Thus, the comprehensive geospatial infrastructure provided by the C4G at LSU directly supports the objectives of the State to protect, sustain, and restore the well-being of people, communities, and ecosystems across the Gulf Coast.

Analyzing Future Coastal Landscape Changes and the Threats to Critical Coastal Shore and Islands, Infrastructure and Communities

Tim Osborn*[1]*, *Stephen Gill[2], Darren Wright[2]*

[1] NOAA Office of Coast Survey, 646 Cajundome Blvd., Lafayette, LA 70506

[2]NOAA Center for Operational Oceanographic Products and Services

NOAA is the Federal authority in the United States for the measuring and reporting of national sea level trends for the nation along our coasts. For the Gulf of Mexico coast, relative sea level trends range from relatively small changes to the world's highest rates of change.

For coastal Louisiana and areas of southeast coastal Texas, rates of relative sea level rise are found in the 9-10 mm range per year. With critical infrastructure and coastal communities facing rise water levels and the increasing threat of coastal flooding, NOAA has developed and employed a coastal inundation analysis for two areas of coastal Louisiana looking at the future water and tide levels and vulnerability of coastal flooding.

This work presents an analysis of the future risks and vulnerabilities of Grand Isle and South Lafourche Parish to rising relative sea level trends and future storms to the state's only inhabited barrier island and the highway connecting Grand Isle and Port Fourchon.

Using local geodetic reference marks, LiDAR imagery, and sea level rise trends, NOAA provides a timeline showing the loss of access to both Port Fourchon and Grand Isle and the growing impacts of storms and hurricanes to coastal island and shore areas.

The diversity of NOAA spatial data and other resources available to address coastal issues will be presented, along with how to access and use them.

Implications

Historic and current data are important tools for understanding the geospatial patterns of coastal processes. The shoreline, which represents the land-water interface is a dynamic natural feature that appears of many NOAA products. However, this feature appears on many different products from NOAA, USGS, and state sources. A key factor in addressing coastal issues is coordinating these various sources; how they are measured and interpreted. Solutions to these problems will continue to be a multidisciplinary endeavor.

Louisiana's Coastwide Reference Monitoring System (CRMS-Wetlands) Web Applications and Visualizations

Sarai Piazza*[1]*, *Craig Conzelmann[1], and Greg Steyer[1]*

[1] U.S. Geological Survey, National Wetlands Research Center, C/O Livestock Show Office, LSU, Baton Rouge, LA 70803

In 1990, the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) was passed by Congress which authorized funding for planning and implementing restoration projects in the Louisiana coastal zone. An important component of the CWPPRA is a 20-year investment in monitoring the effectiveness of individual projects and providing an assessment of the cumulative effects of all restoration and protection projects on the coastal landscape. Monitoring was conducted on a project-specific basis until 2003, when the Coastwide Reference Monitoring System (CRMS - Wetlands) was authorized as a single comprehensive wetland monitoring program that would allow ecological comparisons at site, project, hydrologic basin and coastwide scales. The CRMS contains 390 1-km^2 sites across the Louisiana coastal zone each monitoring a consistent suite of water, vegetation, soil, and landscape parameters at temporal frequencies from hourly to annual.

Large regional monitoring programs have historically had problems effectively delivering data and analytical products from the scientists to the end-users because data management teams commonly operate separately from the scientists that create the data and the users that need the data products. The CRMS program developed teams of scientists and information technology specialists working together to deliver data in a spatially enabled web environment and to develop analytical products and applications that are based on the needs of the natural resource user community.

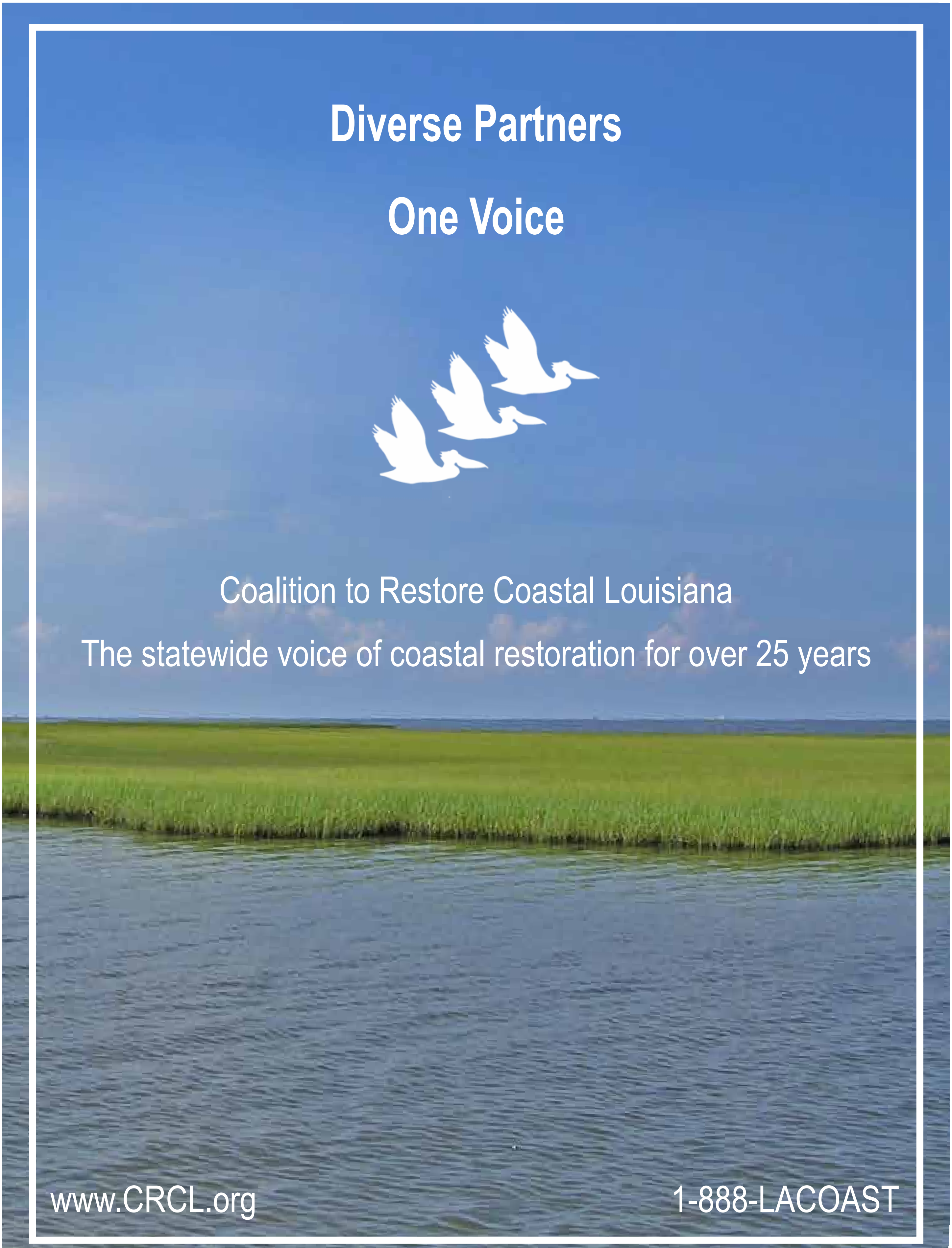
In an effort to highlight CRMS data and analytical products, a website was designed as the one-stop shop for CRMS information, products, tools, and data (http://www.lacoast.gov/crms2/Home.aspx). The website uses a mapping environment as the primary dissemination vector (i.e., Mapping\Basic Viewer) and also includes a robust charting mechanism (i.e., Visualization\Graphs). The ecological data available through the website are linked to the official Louisiana Coastal Protection and Restoration Authority database.

Although the website is designed to be user friendly, it includes many datasets, layers, and tools which can be overwhelming to new users. This talk will present web applications, tools, visualizations, and CRMS report cards that allow for multi-scale assessments.

The CRMS program is as dynamic as the coastal habitats it monitors. The program continues to develop new products and analysis tools while providing data for model improvement and scientific research. The CRMS website is the current dissemination mechanism for all activities related to the program.

Implications

The CRMS program provides a unique and increasingly robust dataset for the entire Louisiana coast. Data from the CRMS program are currently being used to monitor CWWPRA projects, plan future coastal restoration and protection projects, improve modeling efforts, and for scientific research. The CRMS website provides end-users with a consolidated location for a variety of data spanning multiple temporal and spatial scales while providing tools, visualizations, and ecological assessments.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Status and Future of Regional Programs (Room 255)

Moderator: David Muth
National Wildlife Federation

Coastal Impact Assistance Program (CIAP) – A Louisiana Success Story – Managing Coastal Restoration Projects

Robert Routon[1], ***David Williams[1]***, *Travis Woodard[1]*

[1] Coastal Protection and Restoration Authority, Louisiana CIAP, 450 Laurel Street, Suite 1501, Baton Rouge, LA 70801

Louisiana is one of six states eligible to receive $1B CIAP funds from the Department of Interior's Fish and Wildlife Services. Funds were allocated based on offshore oil and gas revenue for each state to mitigate impacts from those activities. States and coastal political subdivisions received approximately $250M for each of the fiscal years 2007-2010. Per formula, Louisiana received $496M (just under 50%) of the program funds. Sixty five percent of the $496M went to the state and 35% went to coastal parishes. There are 106 total projects: 12 state only projects; 17 state/parish projects and 77 parish only projects.

Faced with a complicated grant application process by Department of Interior agencies (MMS, BOEMRE, and now FWS), Louisiana has been able to expedite CIAP to a point that 92% of projects are either complete, in design or under construction. The remaining 8% have experienced temporary complicating factors or will be reprogrammed to other eligible CIAP projects. The presentation provides a synopsis of state, state/parish projects and parish only projects.

The presentation would like to highlight three projects with community support that will impact the coast for many years.

Coastal Forest Conservation Initiative: The conservation, restoration, and sustainability of coastal Louisiana's swamps, wooded cheniers, and natural levee forests are increasingly recognized as one of the keys to the sustainability and ecological diversity of southern Louisiana. The CFCI set up standards to acquire land rights on coastal forest tracts from willing landowners to facilitate conservation; restoring and enhancing forest sustainability by implementing small-scale restoration projects. The program has funding of $20M and has begun acquiring property to meet its objectives. PowerPoint presentation will highlight properties selected in the program.

Central Wetlands Water Assimilation Projects: The Sewerage and Water Board of New Orleans and St. Bernard Parish jointly proposed a regional $10M wetland restoration project using treated wastewater effluent. Research has confirmed that the benefits of using treated wastewater include improved water quality, increased accretion rates to balance a high relative water level rise due mainly to subsidence, improved plant productivity and habitat quality; protection against storm surge and storm generated waves, and decreased capital outlays for engineered treatment systems. The presentation will describe the process needed to get agreements between the three governmental entities, design and construction. Power Point will show the construction at different stages.

Living Shoreline Protection Project: A $20M Bio-Engineered oyster reef project will be constructed along coastal fringe marsh in St. Bernard parish with the goal of reducing wind-wave induced shoreline erosion. Up to 21 miles of bio-engineered reef would be installed from Eloi Point to the mouth of Bayou La Loutre around Lydia Point and Paulina Point extending around the southern shore of Treasure bay. These living shorelines would function to dissipate wave energy before it reaches the shoreline thereby protecting vulnerable shoreline and the valuable marsh behind. A number of products will be considered and a PowerPoint presentation of the available technology will be presented.

Implications

As more funding becomes available to Louisiana and other gulf states, state departments have to be able to effectively manage projects. The CIAP program and highlighted projects are examples of projects and issues faced while managing the Coastal Impact Assistance Program.

The Future of The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), U.S. Army Corps of Engineers Perspective

Brad Inman[1], *Mark Wingate[1]*

[1] *US Army Corps of Engineers, New Orleans District, P.O Box 60267, New Orleans, LA 70160*

The Coastal Wetlands Planning, Protections and Restoration Act (CWPPRA), also originally called the Breaux Act after its initial sponsor, was enacted in 1990 to respond to the loss of coastal wetlands, especially in Louisiana. CWPPRA legislation authorizes funds for three purposes: 70% is for restoration of Louisiana coastal wetlands, 15% is for coastal wetlands restoration in other states, and 15% is to support the North American Wildlife Habitat Management Program. The Louisiana effort is administered by a task force that includes five federal agencies and the state of Louisiana and is chaired and administered by the U.S. Army Corps of Engineers (USACE). CWPPRA has a proven track record of over 20 years of superior coastal restoration science and monitoring techniques in Louisiana.

The task force includes representatives from the USACE (Department of the Army), U.S. Fish and Wildlife Service (Department of the Interior), Natural Resources Conservation Service (Department of Agriculture), Environmental Protection Agency, National Marine Fisheries Service (National Oceanic and Atmospheric Administration, Department of Commerce), and the state of Louisiana's Coastal Protection and Restoration Governor's Office. The CWPPRA program is funded from revenues accumulated in the Sports Fish Restoration and Boating Trust Fund with the major source of funding being the sale of gas for motor boats and the sale of fishing equipment. As of January 2012 there are 151 active projects in the program of which 92 have completed construction, 10 are currently under construction, and 49 currently in a design phase or awaiting funding to move to construction. In 2012 15 addition projects are scheduled to begin construction. Funding is provided primarily by the federal government which pays 85% of the project costs. The state of Louisiana as the designated local sponsor pays the remainder.

Projects are selected through an extensive collaborative planning process known as the annual Project Priority List (PPL) which the 21st PPL was just completed in January 2012 with the selection and approval of 4 projects that will move into the Phase 1 planning and design phase. Efforts are made to involve all interested parties and have resulted in generating strong local endorsement. This effort has emphasized the local benefits that result from projects, especially those benefits that result from improved habitat. The program has worked to include local stakeholders as they can nominate projects in the PPL process ensuring that local unique ecosystems have the opportunity to be restored that may escape the notice of federal or state agencies.

Currently the program is authorized through 2019. Due to an early decision by the program to provide monitoring, operations, maintenance, and management for a 20 year period after construction of a project, the program may be forced to limit expenditures on new projects keeping funding in reserve to meet obligations as 2019 approaches. Decisions by the task force will determine how the program moves forward while also addressing the future of projects that have met their "20 –year life".

Implications

The CWPPRA program which is authorized through 2019 will have expended approximately $2.3 Billion during it program life under current funding guidance. CWPPRA has protected, created, or restored over 100,000 Louisiana wetland acres to date. The program has funded an extensive Coastwide Reference Monitoring System (CRMS) that will continue to provide robust scientific data that better allows decisions to be made on future restoration efforts along coastal Louisiana. Projects built throughout the entire coastal area of Louisiana in each of its hydrologic basins have not only restored valuable wetland resources and their ecological benefits but have provided invaluable experience to a new generation of scientists, engineers, and planners who will continue to work to save the coast. USACE as the program administrator and chair of the task force will play an important role as to how the CWPPRA program moves forward towards 2019.

Louisiana Coastal Area (LCA) Near-Term Project Construction, US Army Corps of Engineers Perspective

Darrel M. Broussard[1]

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Authorized by the Water Resources Development Act of 2007, the $1.996 billion Louisiana Coastal Area Program (LCA) is a systematic approach to restore natural features and processes of the Louisiana coastal ecosystem. The LCA Program includes 15 critical, near-term ecosystem restoration projects, the Beneficial Use of Dredged Material (BUDMAT) Program, and the Demonstration Projects Program.

The focus of this presentation is the LCA 15 critical near-term restoration projects, with emphasis on advancing six of those projects, commonly referred to as the LCA 6, to construction. The 15 near-tem projects were specifically authorized contingent upon completion of the necessary feasibility studies. The Corps and the state are advancing the LCA Program through feasibility and design, to be positioned to initiate construction upon receipt of Federal construction funds. Feasibility studies for the LCA 6 projects, finalized in 2010, resulted in the authorization of $1.4 billion in ecosystem restoration project construction. The six studies addressed various ecosystem restoration projects including barrier island restoration, freshwater and sediment diversions from the

Mississippi River, and creation of wetlands. Design for the first increment of construction for these projects was initiated in December 2011. Pending receipt of Federal construction funds and ability to sign a cost share agreement with the State of Louisiana, we will be positioned to initiate construction on the LCA 6 as early as 2013.

Implications

The Corps and the State of Louisiana initiated feasibility of the LCA 6 projects in November 2008 and entered into agreement to initiate design of these LCA projects in December 2011. We are now positioning to be able to start turning dirt on several the LCA 6 projects. This presentation includes an overview of the LCA 6 projects and highlights efforts to enable initiation of construction of LCA 6 projects as early as 2013.

Deepwater Horizon Oil Spill Natural Resource Damage Assessment: Restoring Louisiana's Injured Resources through Ecosystem Restoration Projects

***Drue Banta*[1]**

[1] *Office of the Governor - Coastal Activities, 1051 N. 3rd Street, Suite 138,Baton Rouge, LA 70802*

Louisiana's coastal crisis was compounded by the 2010 *Deepwater Horizon* oil spill, which released millions of barrels of oil into the Gulf affecting thousands of miles of shoreline, bayous and bays and significantly impacting Louisiana.

The Oil Pollution Act of 1990 and the Louisiana Oil Spill Prevention and Response Act set forth the process for the Natural Resource Damage Assessment (NRDA). It is used to develop the public's claim against the party or parties responsible for the spill and to seek compensation in the form of restoration for the harm done to natural resources and services. It also provides for the development of restoration plans to restore or replace those resources. The Coastal Protection and Restoration Authority, Louisiana's lead trustee, is actively working with representatives from the other affected Gulf States, the Department of the Interior (DOI) and the National Oceanic and Atmospheric Administration (NOAA) to fully assess the injuries to natural resources from the *Deepwater Horizon* oil spill.

NRDA is a long-term process. In an effort to expedite restoration, the Trustees and BP announced an historic agreement to conduct restoration prior to the completion of the assessment, committing an unprecedented $1 billion for Early Restoration.

The NRDA will continue until the trustees have determined the full extent of damages, restoration plans are designed and implemented, and the environment and public are made whole for injuries to natural resources and services resulting from the *Deepwater Horizon* oil spill. Louisiana intends to restore lost resources through ecosystem restoration.

Implications

In April 2010, the *Deepwater Horizon* disaster discharged more than 4.9 million barrels of oil into the Gulf of Mexico significantly impacting coastal Louisiana. The Louisiana Natural Resource Damage Assessment trustees continue to assess the injuries to natural resources and intend to restore impacted resources through ecosystem restoration projects.

Barrier Islands & Shorelines I (Room 253)

Moderator: Michael Stephen

Coastal Engineering Consultants, Inc.

Barrier Islands Restoration in Louisiana – An Overview of Two Decades of Effort

***Syed M. Khalil*[1]**, *Darin M. Lee*[1], *Richard C. Raynie*[1]

[1] *Coastal Protection and Restoration of Louisiana, 450 Laurel Street, Suite 1501, Baton Rouge, LA 70801*

It is well documented that Louisiana's barrier island systems which front the Mississippi River delta plain have undergone landward migration, area loss and island narrowing as a result of a complex interaction among subsidence, sea level rise, wave processes, inadequate sediment supply and intense human disturbance. Consequently, the structural continuity of the barrier shoreline weakens as the headland detaches, and islands narrow, fragment and finally disappears. The barrier islands define the estuary ecosystem while providing safety not only to low lying population centers and infrastructure, but also protect domestic oil and gas industrial facilities. The degradation of delta-front barrier islands jeopardizes the vitality of strategic economic and biological resources (including aquatic habitat) as well as the protection of coastal residents from surge flooding and thus the ecosystem services provided by these islands are unique in many ways and not all of them could be monetized in dollar value. With this understanding the State of Louisiana has undertaken construction of these islands for the last 2 decades. These restoration efforts primarily depend on emplacement of sediment to build up barrier and deltaic systems, both in elevation and volume, so that geomorphological and ecological environments can persist within decadal time frames with minimal redressing after the initial placement of sediment. The rehabilitation and reconstruction of these barrier islands and wetlands, not only requires knowledge of coastal hydrodynamics, coastal engineering, coastal geomorphology, and biology but also of the framework geology and sedimentary resources. The challenge lies in translating this knowledge into coastal morphodynamic models which could provide a basis for establishing an engineering approach that in turn will provide needed stability of barrier islands and the buffer for wetlands.

Physical and biological monitoring of projects as well as system –wide under the Barrier Island Comprehensive Monitoring Program (BICM) has facilitated fine-tuning various engineering procedures and has changed the perception and approach to the island construction. Currently, several barrier islands are in the various stages of construction.

During this presentation and two others following in this session; the uniqueness, challenges and strategies of the barrier island construction processes to replicate coastal morphodynamics will be discussed.

Implications

Barrier islands of Louisiana are not only unique geomorphological feature which play a significant role in protecting the economic and biological resources but also provide various ecosystem services. Thus, it is important that we restore these geomorphic features in sustainable and cost effective ways.

Louisiana Barrier Island Restoration Performance Analysis

***Michael T. Poff*[1]**, *Michael F. Stephen*[1], *Jon C. Staiger*[1], *Syed Khalil*[2]

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[2] *Louisiana Coastal Protection and Restoration Authority, Baton Rouge, LA*

In the light of the 2012 Louisiana Comprehensive Master Plan for a Sustainable Coast and its commitment to a long-term effort to reversing coastal land loss, it is timely to review existing data and compare predicted performance with post-construction observations and recent surveys. It will be both beneficial for restoration science in general and for future restoration project designs to analyze monitoring data from constructed projects and determine which elements and features provided enhanced benefits, increased project longevity and survivability, and were more cost-effective. Since the completed projects have been geographically dispersed across both the Terrebonne and Barataria Basins, system-wide comparisons should be an attainable goal.

The presentation will explore the following analyses:

- Region-wide evaluation to demonstrate how each barrier system (e.g. Terrebonne, Barataria) has benefited from the restoration projects and describe how the restoration efforts have affected the longevity and sustainability of the islands and headlands.

- Compilation of existing project data available in project design reports, completion reports, and monitoring reports.
- Shoreline change rate calculations for each barrier system utilizing both project-specific data and that available from other programs, such as Barrier Island Comprehensive Modeling (available data go back to the 1880's). Comparisons of updated change rates with those recently published to establish the range of variation in estimates.
- Beach, dune, and marsh volume change rate calculations for each barrier system utilizing bathymetric, topographic, and LiDAR survey data.
- Marsh platform elevation changes and estimates of their change rates for constructed projects (those with marsh settlement and elevation data; i.e., Chaland Headland and Pass Chaland to Grand Bayou Pass).
- If suitable aerial photo coverage is available, land loss comparisons for each barrier system including predicted years of disappearance for the various islands and reaches.
- Project-by-project comparative analysis of the above parameters between their design predictions and the measured data.

Implications

Updating the shoreline, volume, and land-loss rate changes will facilitate more accurate predictions of barrier evolution by planners, scientists, and engineers. Use of proven design criteria can improve future project design and renourishment planning. A study of marsh elevation changes related to the design settlement curves is needed to ensure project designers are accurately predicting elevation change rates over time to achieve the desired ecosystem restoration benefits.

Grand Isle Barrier Shoreline Stabilization Study

***M.C. Campbell*[1],** *J.D. Carter, P.E. [1], H.E. Bermudez [1], V. Shepsis, P.E., Ph.D. [1], M.O. Chatellier, P.E.[2]*

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[2] *Louisiana Coastal Protection and Restoration Authority*

The Louisiana Coastal Protection and Restoration Authority (formerly Louisiana Department of Natural Resources, Coastal Engineering Division) initiated a study to develop a comprehensive long-term engineering solution for erosion and storm damage reduction to the Gulf of Mexico shoreline of Grand Isle, Louisiana's only inhabited barrier island. The presentation describes a coastal engineering analysis that identified the factors controlling shoreline erosion and a solution scheme developed to meet the project goals based on these factors. The solution consists of six independent components. For each component, alternatives were developed and tested through analytical methods and numerical modeling. The alternatives which best met the evaluation criteria were selected for preliminary design.

The major natural physical processes controlling Grand Isle shoreline erosion include regional deltaic and local geomorphologic trends, reduction in the sediment supply to the island through a reduction in inlet bypassing, relative sea level rise, and storm induced waves and surge. In addition to natural factors, manmade factors along the Grand Isle gulf shoreline over the last 65 years had an impact on both shoreline erosion and accretion.

A range of potential long-term solution alternatives were developed to stabilize and restore the shoreline. These solutions include increasing sediment bypassing across Caminada Pass through a flow diversion structure, rehabilitation of the existing Barataria Pass Jetty, optimizing the Caminada Pass Jetty, modifications to the existing offshore breakwater system, and beach nourishment.

Alternatives analysis and numerical modeling was performed to confirm factors controlling shoreline erosion and to evaluate the performance of the proposed alternatives. Numerical modeling was conducted with 1-D and 2-D wave transformation, tide and wave induced circulation, sediment transport, and shoreline and beach response models. The numerical models were calibrated to existing conditions using an extensive data set obtained from a field data collection program. Based on the evaluation of the component alternatives, a set of preferred alternatives was selected and preliminary design was completed.

Implications

The barrier islands' geomorphology and long-term survival is directly connected to the available sediment supply due to bypassing from adjacent shorelines. This study illustrates a methodology for evaluating sediment bypassing alternatives that could be utilized in the restoration of other barrier islands in Louisiana.

Measuring Back Barrier Marsh Restoration Success and Failure in Centimeters

***Christine N. Pickens*[1],** *Mark W. Hester[1]*

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Restoring the vegetative structure of salt marsh can be fraught with challenges in southern Louisiana; one of the greatest difficulties arises from the micro-tidal hydrology of the region. A micro-tidal hydrology narrows the range of suitable elevations in which vegetation can establish. The Whiskey Island Back Barrier Marsh Creation (TE-50) project located within the Isle Dernieres barrier island chain included the construction of an approximately 1.28 km^2 marsh platform from dredged sediment and native marsh vegetation plantings. Through a combination of greenhouse and field experiments, we investigated ways to enhance establishment of black mangrove, *Avicennia germinans*, and how smooth cordgrass, *Spartina alterniflora*, may facilitate black mangrove propagule establishment. In one greenhouse study, we measured black mangrove propagule survival and establishment under treatment combinations of hydromulch, humic acid, and sand or dredge sediment. In a second greenhouse study, we measured intra- and interspecific interactions between black mangrove seedlings and smooth cordgrass at 24 and 48 ppt salinities and 0 and 500 ml m^{-2} humic acid. At the created back barrier marsh on Whiskey Island, we tested and employed the use of humic acid, biodegradable structures, and specific vegetative planting designs to improve black mangrove establishment.

Results from the greenhouse studies indicated that black mangrove propagule survival and establishment was negligible on dredge sediment, humic acid did not improve survival or establishment, but hydromulch may be beneficial in particular circumstances. Humic acid was beneficial for *S. alterniflora*, though competitive interactions and salinity limited growth. Conversely, black mangrove seedlings were not sensitive to salinities or humic acid, but were negatively responsive towards both intra- and interspecific interactions. Results from a year of monitoring the created back barrier marsh indicated that the use of biodegradable structures with specific vegetative plantings holds some promise for *A. germinans*. Overall, however, success was extremely limited due to minor changes (centimeters) in elevation and hydrology that resulted in major differences in survival of vegetation. Other challenges to success included poor initial planting success of the marsh platform and dredged sediment characteristics. Elevation and relative position to a tidal creek were the primary factors that influenced survival and growth response of both species, demonstrating the importance of hydrology for vegetative establishment. Based on these studies, we learned and will share valuable lessons for back barrier marsh vegetation restoration.

Implications

A goal for coastal restoration ecology should be to understand and enhance processes that already occur naturally. In the case of back barrier marsh restoration, the hydrology of an area should be carefully studied and project designs should utilize hydrologic information from water level gages and tide predictions, as well as inter-annual variations in hydrology. Second, it is important to identify the vulnerabilities of species being used in the restoration design and aim to ameliorate stress to those species. Finally, long-term monitoring of restoration projects can provide valuable insight for future efforts.

Near Shore Dynamics (Room 252)

Moderator: Q. Jim Chen
Louisiana State University

Numerical Simulation of Currents on the Louisiana Shelf

***Mohammad Nabi Allahdadi*[1]*,* *Chunyan Li*[1]

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Current hydrodynamics over the Louisiana shelf contributes significantly to the processes forming the morphological and environmental characteristics along Louisiana coasts. With a relatively weak tidal signal (Wright, 1995; Wright et al., 1997), several other driving forces influence the currents along the Louisiana-Texas (LATEX) shelf. The controlling forces are buoyancy from rivers, wind, and loop current eddies (Oey, 1995). However, wind is the primary driving force for currents along the LATEX coast in shallow waters (Cochrane and Kelly, 1986). Currents over this wider-shelf follow an annual cycle which is resulted from seasonal variations in wind pattern (Smith, 1975, 1978; Crout et al. , 1984; Wiseman et al., 1986; Cochrane and Kelly, 1986; Rego et al., 2010). Westward currents (the down-coast currents) are common during the non-summer months (September to May), driven by the prevailing east and southeasterly winds; while a significant change in wind direction to the west during the summer, results in weak up-coast currents directed to the east (Wiseman et al.,1986; Cochrane and Kelly, 1986). Regardless of the extensive studies, current hydrodynamics of the area has been less studied to support morphological and environmental aspects properly. Although, a long-term continuous measurements of currents are available over this area through the WAVSIS program, high resolution skill-assessed models are required to be incorporated in multi-discipline modeling studies of former mentioned aspects. In the present study, FVCOM (Finite Volume Coastal Ocean Model) was utilized to prepare a three-dimensional skill-assessed model of the shelf area which can be confidently applied to such studies. The modeling area covers east of the Mississippi River Bird-foot Delta to the east and northern Texas shelf to the west. The model was forced by NCEP wind field resolving for two dimensional variations of wind speed and direction over the modeling area. Also, tidal variations of water level were applied as the boundary condition for the open boundary. River discharges were applied to the model based on USGS daily data. Current measurements from a number of WAVSIS stations including CSI-3,CSI,6,CSI-9, and CSI-16 were selected to calibrate the model by tuning wind friction factor, bed resistance, and vertical diffusion coefficient.

Implications

We tried to prepare a skill-assessed hydrodynamics model over the Louisiana shelf calibrated using some high quality measured data of currents located at the inner-shelf area. Although a number of modeling studies of current hydrodynamics are available for this area, the calibration procedure or calibration data were not accurate enough in order for a multi-discipline application with other models. The present modeling will provides a reliable base for implementing modeling studies of sediment transport and environmental aspects including oil spill, hypoxia and other pollutants.

Impact of Hydrodynamics on CDOM Distribution over the Louisiana-Texas Shelf: A Study Using Hydrodynamic Modeling and Ocean Color Data

Nazanin Chaichi [1]***,*** *Eurico J. D'Sa*[1]*, Dong S. Ko*[2]

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One of the important aquatic constituents which makes coastal environment in Louisiana shelf complex in terms of optical properties is Chromophoric dissolved organic matter (CDOM) introduced to the Gulf of

Mexico through the Mississippi Delta and Atchafalaya River's discharge. Monitoring and studying CDOM which is the only colored component of dissolved organic carbon (DOC) can provide us valuable tool to improve our knowledge about global carbon cycling. Advective forces introduced by hydrodynamics phenomena can highly contribute to CDOM distribution over the shelf. The process can be studied using a combination of ocean color data (to obtain the spatial and temporal distribution of CDOM) and outputs from a hydrodynamics model presenting current characteristic. In this regard, the seasonal distribution and transport CDOM along the Louisiana-Texas coast was examined using SeaWiFS satellite-derived estimates of CDOM and the outputs of a 3-dimension Navy coastal ocean model (NCOM) in order to gain insights into advective influences on surface and subsurface CDOM distribution. Previous studies in the region have identified two distinct coastal current patterns driven by seasonal climatology. The predominantly downcoast (westward) flow during September to May are forced by the easterly winds, the freshwater discharge from Mississippi and Atchafalaya Rivers, and often currents induced by loop current eddies. Upcoast or easterly flow is generally dominant during the summer months (June-August). Based on the two different seasonal current patterns over the Louisiana shelf, the contribution of coastal currents on CDOM distribution have been addressed using SeaWiFS imagery and NCOM model simulation for representative months during 2005-2008. Disorganized summertime current pattern disperse CDOM toward the outer shelf, while consistent currents pattern corresponding to persistent westerly winds advetcs river-discharged CDOM over the inner-shelf resulting larger areas affected by CDOM on the inner-shelf.

Implications

This study attempts to find the contribution of physical process including advection by currents on CDOM distribution on the Texas-Louisiana shelf. This would help for quantification of both biochemical and physical factors on CDOM distribution which can lead to a better understanding of aquatic carbon cycle. In addition, this study demonstrates the use of numerical model results to elaborate CDOM dynamics.

Long-term Dynamics of Suspended Particulate Matter along the Louisiana-Texas Coast from Satellite Observations

***Eurico D'Sa*[1],** *Harry Roberts*[1]

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Coastal waters such as those influenced by the Mississippi and Atchafalaya Rivers have high concentrations of suspended particulate matter (SPM) which may comprise of sediments or biogenic material such as detritus and algal matter. In river deltas, a large fraction of SPM is comprised of suspended sediments. Satellite derived estimates of SPM along the Louisiana and adjacent coast could provide additional inputs for coastal restoration, as a water quality indicator and for calibrating regional sediment transport models. Data from satellite sensors such as the SeaWiFS ocean color sensor with over ten years of continuous data can provide valuable information on the spatial and temporal distribution of suspended sediments and fluxes, especially during storms and hurricanes for assessing sediment resuspension and transport. In this study ocean color data from the SeaWiFS satellite sensor were analyzed using a regional algorithm to examine both short and long-term trends in SPM in the northern Gulf of Mexico coastal region dominated by the Mississippi and Atchafalaya Rivers. Dominant scales of SPM variability were examined by applying wavelet analysis to a 10-year time series (September 1997 to December 2008) SeaWIFS data across transects on the inner shelf including the Atchafalaya Bay. Strong seasonality with largest magnitude in SPM variability in fall/winter was associated with cold front passages and minimum variability was observed in the summer. Maxima in interannual SPM variance were more likely to occur during years of tropical depression storms and hurricanes followed by elevated river discharge and cold front activity during the fall/winter period that enhanced SPM transport across the Atchafalaya delta.

Implications

A better understanding of the suspended particulate matter (SPM) dynamics along the Louisiana and adjacent coast is needed as it plays an important role as an indicator of pollutants, water quality and sediment transport. Along the Louisiana coast a large fraction of the SPM is comprised of suspended sediments, a resource that is important for coastal restoration. Satellite remote sensing with its synoptic, repeated, and long-term coverage can provide critical inputs to sediment transport models and for various coastal restoration studies.

Modeling Strategy for the Development of a Mechanistic Model of Phytoplankton Growth in Little Vermilion Bay

***Barbara Benson*[1]**

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Current research efforts are under way which focus on the development of a mechanistic model of the phytoplankton growth kinetics in Little Vermilion Bay, Louisiana with solar irradiance and light dynamics as a forcing function of the model. Modeling of phytoplankton growth has typically been probability based and nutrient driven. A mechanistic model of primary production will enhance our understanding of this process in the location of the TV-12 project which is located in the northwestern corner of Little Vermilion Bay at its intersection with the Gulf Intracoastal Waterway (GIWW) and help in the assessment of the health of this ecosystem.

The modeling strategy includes a complex conceptual model including: surface irradiance on a diurnal and seasonal temporal scale; light attenuation and its relationship to biomass concentration, chlorophyll-a and phycoerythrin; the effect of irradiance and phytoplankton growth; the hydrologic dilution rate due to inflows from tides, runoff and channel flows; intrinsic bio-rhythms and stochastic processes. The governing equation will be serial mass balances.

The surface irradiance with its diurnal, seasonal weather variations will be modeled by sinusoidal functions with a minimum threshold at sunset and sunrise and seasonal variation in amplitude and period length. Fourier analysis of the effects of cloud cover on irradiance will be completed to isolate harmonics in weather patterns and any remaining stochastic component of surface irradiance associated with weather will be modeled using Monte Carlo methodology.

Lambert–Beer law will be applied for modeling light attenuation within the water column:

$$I_z(PAR)\text{-}I_{OS}(PAR)e^{k0(PAR)z} \qquad (1)$$

where $I_z(PAR)$ is the scalar irradiance at depth z (μmol s^{-1} m^{-2}), I_{os} is the surface scalar irradiance $k_0(PAR)$ the overall scalar attenuation coefficient (m^{-1}); $k_0(PAR) = (k_w + k_b X)$, k_b the biomass attenuation coefficient (m^2 g^{-1}), k_w the water attenuation coefficient (m^{-1}), X the biomass concentration (g dry wt m^{-3}) and z = depth (m). It will be integrated over the depth of the water column to determine I_a the average irradiance in the water column. Steel's equation will be used to model growth (μ):

$$\mu=\mu_{max}\frac{I_a(PAR)}{I_{opt}(PAR)}\ e^{1-I_a(PAR)/I_{opt}(PAR)} \qquad (2)$$

where μ is the specific growth rate (d^{-1}), μ_{max} the maximum specific growth rate (d^{-1}), and $I_{opt}(PAR)$ the scalar irradiance (μmol s^{-1} m^{-2}) associated with μ_{max}. The μ will be multiplied by factors that reflect the effect of temperature, turbidity nitrogen, phosphorous, and carbon. Collecting empirical data on these parameters will be necessary for modeling and understanding production under various conditions. Fourier analysis of temperature will be completed to isolate harmonics in weather patterns and any remaining stochastic component of its effect on μ associated with weather will be modeled with probability using the Monte Carlo methodology.

Implications

The Coastal Protection and Restoration Authority is confronted with the challenge of determining how well a proposed restoration effort will work to improve ecosystem services including water quality improvement. There is an identified need for improving model certainty by including mechanistic models of light dynamics and phytoplankton growth kinetics. This research effort is to address these deficiencies and develop a mechanistic model of phytoplankton growth with solar irradiance as a forcing function. This mechanistic model is being developed to simulate primary production in the location of the TV-12 project in Little Vermilion Bay, Louisiana. The functioning of an ecosystem depends on the basic energy of solar radiation. Understanding primary production in response to solar radiation and light dynamics in an estuary is important when assessing its health. The proposed model will help to assess the post project water quality of the TV-12 project area and will provide a framework for the development of models for other project sites.

Keynote Speaker

Monday, June 25 12:00-1:30

Bill Mohl

President & CEO, Entergy Louisiana, LLC. and Entergy Gulf States Louisiana, LLC.

Bill Mohl is the president and chief executive officer of Entergy Louisiana, LLC and Entergy Gulf States Louisiana, LLC., which together serve over one million electric customers in Louisiana. He is responsible for the companies' electric transmission and distribution systems, customer service, regulatory and governmental relations, economic development programs and charitable contributions, as well as the companies' financial performance. He also has operational responsibility for Entergy's gas distribution business in Louisiana.

Mohl has held numerous leadership positions with several different energy companies, including several senior leadership roles with Koch Industries Inc. in Houston, Texas from 1995 through 2002. He was also director of power operations for Koch Energy Trading, vice president of KET, chief operating officer for Koch Midstream Services and chief operating officer for Koch Investment Group.
From 1982 through 1995, Mohl was employed by Public Service Company of Colorado, where he held a variety of roles in the power system operations and wholesale market areas.

Mohl holds a bachelor of science degree in business administration and finance and a master's of business administration degree from Regis University in Denver.

Concurrent Session II

Monday, June 25 1:30-3:00

Topographic Mapping Applications (Room 257)

Moderator: John Brock
USGS

USGS-USACE-CPRA-NLCLDD Collaboration on Coastal Louisiana Airborne and Terrrestrial Lidar Levee Acquisition Pilot Project

***John Barras*[1]*,* *John C. Brock[2], Maurice Wolcott[3]*

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[2] *USGS Coastal and Marine Geology Program*

[3] *Louisiana State University Sea Grant*

The U. S. Geological Survey (USGS), National Geospatial Technical Operations Center (NGTOC) is working with the USGS Coastal and Marine Geology Program's (CMGP) Northern Gulf of Mexico Landscape Change and Hazards Project (NGOM), the Louisiana Coastal Protection and Restoration Authority (CPRA), Louisiana Sea Grant (LSG), The North Lafourche Conservation Levee and Drainage District (NLCLDD), The South Lafourche Levee District, and the Terrebonne Levee and Conservation District to develop an initiative to map and monitor non-federal levees using targeted airborne and terrestrial Lidar surveys. The Lafourche Parish levee system was chosen for the pilot levee Lidar acquisition. Airborne Lidar was acquired for the in late January and early February of 2012. High resolution Lidar data was acquired in a 100 m swath following the centerline of each levee. A USGS ground team acquired experimental truck mounted terrestrial Lidar of selected levee segments in April of 2012 to investigate improving the horizontal and positional accuracy of the airborne Lidar and to provide unique high resolution side-view profiles of selected levee sections.

The USGS is developing a suite of software analytical tools for rapidly analyzing both user-defined and automated Lidar derived levee metrics including cross sectional profiles, slope, volume, etc. The USGS is working closely with CPRA, LSG, and NLCDD staff to assess Lidar functionality for rapidly acquiring baseline levee metrics and for monitoring levee conditions over time at regional scales. Acquisition of levee metrics presently relies heavily on ground surveys. The airborne and terrestrial Lidar levee data acquisitions may prove useful in augmenting traditional ground based survey information for assessing and monitoring levee conditions while offering a unique 3-dimensional perspective of non-federal levees. Benefits include the acquisition of time-consistent continuous elevation information for the entire parish levee system, the capability to visualize the levee system in 3 dimensions, potential cost-effective levee monitoring, and improved levee elevation and location data for coastal elevation, hydrologic, and surge modeling. The Lidar levee data will also be used to improve USGS National Elevation Dataset (NED) for coastal Louisiana. Future levee Lidar data acquisitions are planned to examine the feasibility for using Lidar to monitor potential changes in levee elevation and volume with time.


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Tiffany Ragan, Customer Service Specialist
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Implications

The Lafourche Parish levee mapping initiative is a pilot project to explore the feasibility of using airborne and terrestrial Lidar to rapidly map and acquire accurate elevation data and other levee metrics for non-federal levees in coastal Louisiana. The State requires an assessment of parish levee conditions every three years. The burden of this assessment falls on parish levee managers. The USGS CMGP NGOM sponsored levee acquisition and data analysis for Lafourche Parish should provide valuable information on the feasibility of monitoring non-federal levees using airborne and terrestrial Lidar.

Improved non-federal levee elevation and positional data will allow parish levee managers to better assess levee conditions within their districts while providing CPRA with more consistent non-federal levee information. The lidar derived elevation information will be used to improve the NED as well as provide improved coastal elevation and storm-surge modeling.

Mapping Levees in Lafourche Parish, Louisiana Using High Resolution Mobile Terrestrial Lidar

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The higher point density and mobility of terrestrial lidar is advantageous when extremely detailed elevation data is needed for mapping features such as levees, dunes, and shorelines. Terrestrial lidar data is particularly useful in low-relief environments such as the Louisiana coastal zone where very accurate, high-resolution elevation data is critical, particularly for hydrologic and sea-level rise models.

Currently, there is little reliable elevation data for most levees in south Louisiana because of high rates of subsidence, and the difficulty of mapping long stretches of levees using GPS or traditional surveying techniques. The purpose of the study is to demonstrate the ability to collect high-resolution, high-accuracy elevation data that will benefit local levee districts in south Louisiana as well as the coastal monitoring and restoration community. Because of the higher point density, greater level of accuracy, and side-looking field of view, mobile terrestrial lidar offers advantages to aerial lidar in both low-lying regions and high relief landscapes adjacent to shorelines. For example, mobile terrestrial lidar is well-suited to mapping linear features with vertical relief such as cliffs, dunes, or levees and where very accurate and detailed elevation data is needed. Applications of this terrestrial lidar data include mapping variations in levee height, calculating levee cross-sections, developing a high accuracy DEM for use in storm surge or sea-level rise models, and creating a baseline for repeat surveys to measure local subsidence or degradation of the levee height and side slopes.

We conducted a field survey of selected levee segments in Lafourche Parish, Louisiana using a mobile lidar scanner mounted on a truck. The scanner is integrated with two GPS receivers and an inertial measurement unit to produce a point cloud georeferenced to the UTM coordinate system and the NAVD88 vertical datum. The vertical and horizontal accuracy of the lidar data was assessed by conducting a GPS survey of targets spaced throughout the study area to collect independent elevation data. Products developed from the terrestrial lidar data collected along levees in Lafourche Parish are illustrated, such as digital elevation models, levee cross sections, and levee crest heights.

Implications

Local levees are often relatively narrow and have a relatively low height (i.e. 1-2 meters) compared to Federally-maintained levees. However, these small local levees often have a major impact on hydrologic flow because there is so little topographic relief in south Louisiana. High-quality elevation data is therefore critical to local levee district managers as well as the Louisiana coastal monitoring and restoration communities. The terrestrial lidar survey of Lafourche Parish levees demonstrates the use of a relatively new technology for mapping features such as levees at a high level of detail, or for repeat surveys to measure localized geomorphic changes.

LADOTD Topographic Mapping Program – Building the Digital Geospatial Database of Louisiana

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Topographic mapping in Louisiana has a long history, dating back to 1928, when Act 159 was enacted, giving what is now the Department of Transportation and Development (LADOTD) responsibility for topographic mapping in the state. Since them Louisiana has collaborated with the US Geological Survey (USGS) in their Cooperative Topographic Mapping Program. In 2010, Act 782 codified these responsibilities into Louisiana Revised Statute 48:36, "Topographic mapping." This statute gives LADOTD the responsibility for setting standards for collecting data and management of a geospatial database of Louisiana. In addition, LADOTD has been designated as the geographic names authority for the state.

This presentation highlights the history and status of mapping in Louisiana. It will provide a current invdentory of completed topographic map updates, as well as other efforts to update and improve geospatial data in Louisiana. Examples will be used demonstrate some of the current issues with maps and geospatial data and how those problems have serious implications for oastal restoration and management.

Implications

Environmental management is simply the wise application of science. Today, models are used to understand the natural processes along the coast. In addition, models are used to test and propose various management and restoration alternatives. However, models are useless without good data. We will only be able to get good data through cooperation among all levels of government and the private sector. Until that happens, we will continue to struggle with data issues. We need to develop a common operational picture upon which everyone can participate in coastal restoration ad management activities.

Atchafalaya & Wax Lake Basin & Deltas (Room 255)

Moderator: Clint Willson
Louisiana State University

Atchafalaya Basin Sediment Management Plan – Objective and Strategies

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The Atchafalaya Basin, and the expanding deltas at its outfall into the Gulf of Mexico through the Wax Lake Outlet and the mouth of the river below Morgan City, plays an important role in southern Louisiana, including providing essential wildlife habitat. The Atchafalaya River presently carries approximately 30% of the Mississippi River's flow and during extermely high river flows, the Atchaflaya Basin serves as a major alternative path for Mississippi River floodwaters As the only portion of Louisiana's coastal region where land mass is being created, sediment resources within the basin need to be carefully managed. Estimates suggest that as much as 88 million tons of sediment are delivered annually into Atchafalaya Bay. However, recent studies have indicated that the sediment load exiting the Atachafalaya River Basin has been decreasing in recent times. Consequently, it is critical to understand both the historic and current environmental conditions within the Basin as well as the historic and current sediment transport/dynamics within the basin. This will facilitate effective sediment mangment within the basin to maintain open channels and preserve habitat. An understanding of the Mississippi-Atchafalaya water and sediment budget throughout the Atchafalaya Basin is also critical in planning engineered diversions and other mechanisms for reintroducing riverine sediments into the Louisiana coastal zone.

In order to understand the sediment loading, transport patterns, and identify the deposition/erosion areas in the basin, an extensive literature review was performed and data inventory was compiled. The historical patterns and trends of sediment processes within the Atchafalaya River were collected to describe the natural and anthropogenic changes over the past 100 years. A 2-D hydrodynamic model (Advanced Circulation or ADCIRC SL17) was used to simulate high and low flow conditions within the basin. In particular, model output combined with sediment loading and sediment size characteristics were utilized for understanding sediment transport dynamics, as well as hydrodynamic processes within the Atchafalaya Basin. Different alternatives for sediment management are discussed, and best management practices are evaluated to develop a comprehensive sediment management plan based upon a sediment budget analysis.

Implications

The Atchafalaya Basin Sediment Management Plan is intended to understand the quality, quantity and transport patterns of sediments within the basin; identify areas of the system that are prone to erosion or deposition; describe how the river can be managed to optimize sediment deposition in areas where sediment is needed, increase habitat continuity, and manage deltaic growth processes. The main objective is to recommend sediment management strategies that maximize the delivery of sediment to the coast. This study summarizes the sediment management alternatives and conclusions of the Atchafalaya Basin Sediment Management Plan. The Atchafalaya River Basin Sediment Management Plan will be integrated with the Louisiana Sediment Management Plan (LASMP) and will provide much needed insight into management of Lower Mississippi River for a sustainable coastal restoration of Louisiana.

Calibration of a Hydrodynamic Model of the Atchafalaya Basin to the 2011 Flood

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The Mississippi River flood that peaked in May 2011 was among the largest and most damaging recorded along this U.S. waterway in the past century, comparable in extent to the major floods of 1927 and 1993. Record levels of rainfall on the Mississippi watershed combined with a late springtime thaw of record accumulations of snow in the upper Mississippi watershed caused the Mississippi River and its most significant distributary, the Atchafalaya River, to swell to record levels by the beginning of May.

A dependable hydrodynamic model of the Atchafalaya Basin is critical to making decisions about flood management and environmental stewardship. During the Deepwater Horizon oil disaster, the White House considered reducing the customary 30 percent flow down the Atchafalaya to increase discharge into the more affected part of the delta to keep oil from coming ashore. Conversely, during the 2011 flood event, discharge diverted into the Atchafalaya from the Mississippi was elevated above 30 percent to reduce stress on Baton Rouge and New Orleans levees downstream, putting Morgan City at greater risk. Great progress has been made in determining the drivers, hydraulic and otherwise, that govern the ecology of the Atchafalaya system. But efforts to develop a numerical model for forecasting purposes of the complex fluvial and tidal hydrodynamics of the Atchafalaya system have concentrated on the lower, coastal portions of the Atchafalaya basin. Under contract to the National Audubon Society Moffatt & Nichol (M&N) developed a 2-D hydrodynamic model that integrates both the marine and river-dominated parts, capable of informing and testing proposals for improving environmental management of sediment and water both within the basin and at the coast.

M&N performed a comprehensive review of existing modeling efforts and available modeling systems to determine those most capable of answering the proposed large- and small-scale management changes while remaining compatible with other state and federal efforts already underway in the Atchafalaya Basin and coastal zone. It was determined that the Danish Hydraulic Institute Mike 21-flexible mesh modeling platform is most suitable.

The M&N team developed a field data collection program to coincide with the flood event in the Atchafalaya River and basin in 2011. Combined with data from federal and state agencies this resulted in an unprecedented wealth of hydraulic and hydrologic field data from over 300 locations used to refine and improve the model calibration. The model is being refined for specific investigations called for in WRDA 2007, including determination of “the maximum effective use of the water and sediment of the Mississippi River and Atchafalaya River for coastal restoration purposes consistent with flood control and navigation” and evaluation of proposed alterations in the operation of the Old River Control Structure, consistent with flood control and navigation purposes, including the ability to “pulse” flow outside of the conventional 30/70 ratio into the Atchafalaya River. To demonstrate versatility, a nested model is being developed to test small-scale concepts for low-cost rejuvenation of the Cocodrie Swamp proposed by the State Atchafalaya Basin Program.

Implications

A comprehensive, large scale basin model with this level of accuracy will prove to be useful in assessing large scale impacts from proposed large scale water and sediment management changes for the Louisiana coast. In addition to the assessment of basin restoration and resource management initiatives, it is intended to provide the model with a resolution capable of evaluating individual restoration projects. By nesting high resolution models within the existing domain it is possible to provide focused high resolution individual project assessments without having to refine the whole model grid and incur the impediments to processing time and computing horse-power such a refinement would normally require.

Impacts of Large Flood Events on Sediment Dispersal Patterns and Channel Migration: Atchafalaya River, LA

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An analysis was performed comparing a segment of the 2010 and 2011 Atchafalaya River mutibeam surveys to the 1967 and 1977 USACE Hydrographic Survey transect points. The segment of river included areas south from Simmesport past Morgan City, or river miles 0-126. In the approximately 45 year period covered by the four surveys, marked changes have occurred in the river bottom. Eleven sections of the river, in particular, show large amounts of scour. These areas are generally narrow sections of the river, and appear to be in bends and/or adjacent to revetments. Strong localized sediment erosion is evident in these areas. Most of the scour holes identified in this study are between 80 and 150 feet deep.

Closer examination of the eleven areas identified to exhibit scour shows that the 1973 and 2011 floods were the controlling factors in the morphology of these reaches of the river. Comparison of the 1967 and 1977 surveys shows drastic erosion in these areas, accounting for most of the depth increases in each area, often up to 80%. Comparison of the 1977 hydrographic survey to the 2010 Multibeam Survey reveals an additional deepening of the affected areas, often adding up to 30 feet of depth. New post-flood 2011 multibeam data appears to show that a single large flood event may accelerate these trends. Significant lateral channel migration is also evident, with an increase of 50% or more of the width of the channel. In one case, the channel migrated laterally to such an extent that the 1967 hydrographic survey transects now appear to be on forested land.

Significant change has occurred along several reaches of the river, due to channel migration. Lateral migration of the river channel has led to the redistribution of sediment, creating erosion in some areas and deposition in others. This redistribution is seen to lead to net erosion in some areas, and no net sediment gain or loss in other areas. The 1967 and 1977 hydrographic surveys were compared to the 2010 and 2011 multibeam surveys to provide approximate shoreline and thalweg locations over the last 45 years. In one example, the cutbank has migrated a distance of 1,715 feet, with an annual rate of 40 feet per year. In this location, the maximum depth at the thalweg was -96 feet in 1967, which increased to -113 feet in 1977, and is presently -138 feet. The scour feature migrated downstream with the channel migration. This pattern is evident in the other locations as well.

It appears that areas of active channel migration coincide with scour features, in most occurrences in the Atchafalaya River. These locations are characterized by sharp turns in the river channel. Turn and scour features migrate downstream over time, with rates on the order of 100 feet per year. Guide levees do not appear to have any influence on channel migration, as they are far enough away from the channel and do not confine the morphology of the river.

Implications

A better understanding of erosion and deposition patterns and channel migration in the Atchafalaya River is essential for effective management of sediment within this basin. In order to achieve their mandate, the Coastal Protection and Restoration Authority of Louisiana (CPRA) would like to ensure continued sediment transport to the coastal zone from the Atchafalaya Basin in order to build sustainable land mass through deltaic-growth processes in both the Wax Lake Outlet and the mouth of the Atchafalaya River. Understanding of changes in river morphology through time may provide knowledge of not only the present depocenters of high quality, sand-rich sediments, but also provided indicators for future locales of such deposits. Most importantly understanding the Atchafalaya River system and its sediment dynamics will help us provide insight into management of the lower Mississippi River for a sustainable restoration of coastal Louisiana.

Louisiana Coastal Area (LCA) Mississippi Hydrodynamic and Delta Management Feasibility Study (Room 253)

Moderator: Alisha Renfro
National Wildlife Federation

LCA Mississippi River Hydrodynamic and Delta Management Study Overview

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Title VII of the Water Resources Development Act 2007: (Public Law 110-114, 121 STAT. 1270) authorizes the Louisiana Coastal Area (LCA) program. The *2004 Louisiana Coastal Area, Louisiana Ecosystem Restoration Study* was recommended to Congress by a Chief of Engineers report dated January 31, 2005, which called for a coordinated, feasible solution to the identified critical water resource problems and opportunities in coastal Louisiana. The Mississippi River Hydrodynamic and Delta Management Feasibility Study combines two of the six large-scale and long-term restoration concepts (the Mississippi River Hydrodynamic study, and the Mississippi River Delta Management study) outlined in the LCA 2004 Study.

Because the Mississippi River is such a significant and valuable resource in supporting sustainable restoration in coastal Louisiana, a focused and deliberate examination of the available freshwater and sediment resources and efficient methods to acquire these resources is necessary. On the lower Mississippi River, navigation and flood control have been the drivers for most of the current authorities, policies, laws and funding. Over the last 25 years, coastal Louisiana has realized the negative implications of levee construction and primarily the influence of isolating river water and sediments from the surrounding swamps, wetlands, marsh and barrier islands that would normally reside within the river flood plain. This study will strive to provide solutions to sequester river resources for sustainable coastal restoration, that work in harmony with existing navigation and flood control uses.

The study will analyze and model water and sediment transport processes over more than 300 miles of the river (Old River Control Structure to the Gulf of Mexico) under a wide range of river flow and diversion scenarios. Multi-dimensional models will be integrated with a one-dimensional model to examine flow and river fluxes, morphology change, sediment content, and particle size distribution as a function of location, flow and depth and local morphology, scour and shoaling of the river bed, salinity intrusion, and the concentrations of key nutrients that may factor into gulf hypoxia and wetland health. Riverine models will provide comprehensive tools to provide solid science to support decision making on any recommended action and will establish both the amount of resources available spatially and temporally and to determine how to effectively apply those resources to sustain marsh elevations above relative sea level rise.

The feasibility report analysis will include new alternatives developed in this study and those identified in the Louisiana Comprehensive Master Plan for a Sustainable Coast (2012). The study will select large-scale restoration features (e.g., sediment diversion, channel realignment, etc.) and combinations of those features to identify alternatives which greatly increase Mississippi River sediment input to coastal areas. After an evaluation of an array of alternatives using modeling outputs and other selection criteria, a recommended plan will be described in the final feasibility report. This report will then be transmitted to Congress for construction funding of the features identified in the recommended plan.

The Mississippi Hydrodynamic and Delta Management study final deliverables will include multi-dimensional modeling to simulate river processes and evaluation of bay-side impacts; one-dimensional modeling for evaluating long-term channel changes and delivery of sediments; and a feasibility report identifying large-scale restoration features which will greatly increase sediment delivery into surrounding wetlands. This presentation will focus on the goals, objectives, an outline of technical tasks to be completed during the five year study, and final deliverables for the project.

Implications

The Mississippi Hydrodynamic and Delta Management Study will synthesize an unprecedented amount of existing data and reports, as well as collect new data, which will provide reliable estimates of quantities of sediment and freshwater available for coastal restoration without compromising navigation and flood protection functions. The models developed in the study will provide a strong technical basis for which to evaluate large-scale restoration alternatives derived during the study and supplied by the Louisiana Comprehensive Master Plan for a Sustainable Coast (2012) that allow for sustainability in the wetlands adjacent to the Mississippi River.

LCA Mississippi River Hydrodynamic and Delta Management Study - Geomorphic Assessment of the Lower Mississippi River, Old River to the Gulf of Mexico

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A geomorphic assessment is one component of the LCA Mississippi River Hydrodynamic and Delta Management Study (MRHDMS). The geomorphic assessment integrates field surveys, gage data, sediment data, hydraulic data, hydrologic trends, and natural and anthropogenic changes to characterize process-form interactions of the Mississippi River, identify control points and problem locations, and support division of the system into distinct reaches or areas that may be individually classified with respect to morphology. The geomorphic assessment alone is not sufficient to guarantee that a project will perform adequately with regard to morphological and ecological goals, but it is a valuable and necessary component of the integrated channel design process of the MRHDMS that is essential to ensure long-term sustainability in the river. The overall objective of the geomorphic assessment is to document the historic trends and changes in hydrology, sedimentation, and channel geometry, and to summarize the local changes observed at locations where repetitive datasets exist as well as other reaches of interest. The geomorphic assessment is focused on the Mississippi River between the Old River Control Complex and the Gulf of Mexico.

Specific tasks of the geomorphic assessment include: (1) Data compilation; (2) Geometric data analysis; (3) Gage and discharge analysis; (4) Dredge records analysis; (5) Sediment data analysis; (6) Events timeline analysis; and (7) Relative sea level rise analysis. These tasks will be integrated to form the basis for the comprehensive understanding of the river system. The results from each analysis will be combined to establish the trends in river morphology and sedimentation from an historic perspective, as well as for the post-engineering-activity time period. The data sets to be utilized in the geomorphic assessment (such as stage/discharge, sediment concentration, and channel bathymetry) are based on field measurements that include some degree of uncertainty. Therefore, the assessment must include identification and analysis of the potential uncertainty of each data set.

Implications

The geomorphic study must be appreciated as a seamless portion of the overall LCA MRHDMS and not merely as an isolated step that concludes with a transfer of data sets. The knowledge base acquired through the geomorphic assessment is a critical component of the subsequent modeling and data collection efforts. The wider contribution provided by the geomorphic assessment is to establish the system context which will:

- Identify data gaps and the need for additional data;
- Allow rapid assessments of alternatives and uncertainty of alternatives;
- Aid in the proper selection, calibration, and interpretation of the results from the numerical models;
- Anticipate potential long-term maintenance issues; and
- Allow the opportunity to propose a post-project assessment of the system and recommend a monitoring protocol for the project.

LCA Mississippi River Hydrodynamic and Delta Management Study – One and Multi Dimensional Modeling

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The proposed models that will be used for the LCA Mississippi River Hydrodynamics and Delta Management Study will help identify available riverine resources, facilitate our understanding of the dynamical nature and governing processes, aid in the development of a sustainable coastal restoration plan for the lower Mississippi River, quantify the potential land building in the receiving basins, and assess the impact of diverted water on the receiving basins. The models will be used to investigate large-scale restoration strategies (including improved diversion structure efficiency in sediment capture, and channel realignment scenarios) along the Mississippi River. The study will investigate the restoration strategies outlined in the Louisiana Comprehensive Master Plan for a Sustainable Coast (2012).

Presently, numerical flow models have been successfully applied to provide information on stage, discharge, and complex two- (2D) and three-dimensional (3D) flow patterns including horizontal and vertical flow velocities, eddies, flow acceleration, and turbulent fluctuations. However, capabilities in modeling sediment transport and morphology change, such as simulating sediment concentration over the water column, entrainment mechanisms, flocculation, and migration of bed forms, are not as advanced. High quality field data is critical to validate and support an ensemble approach to multi-dimensional modeling (i.e. the use of overlapping models to answer the complicated sediment and water flow questions this project requires). The ensemble modeling approach consists of overlapping components (in terms of processes and domain) to gain confidence in the model results since these results will guide how we manage the river and its resources for coastal restoration, while maintaining navigation and flood protection at desirable levels. Each model used in this ensemble will have a clear objective and collectively, these models will provide necessary redundancy without duplication, and will be used to examine hydrodynamic and sediment processes over a variety of spatial and temporal scales.

The study will set up several one- and multi-dimensional models to facilitate regional- and sub-regional-scale evaluation of large-scale restoration projects from a systems perspective. The 1D models will provide data for analysis resulting from large-scale (spatial) and longer-term (temporal) simulations, while the 2D and 3D models will evaluate sub-sections of the

Lower Mississippi River focusing on event and annual time scale simulations, as well as specific stage/flow conditions such as peak or low stage. One-dimensional modeling is vital to providing information from a variety of conditions and effectively help analyze cumulative impacts resulting from coastal restoration projects along the river. Multi-dimensional modeling provides information on spatial variability in water flow and sediment delivery, and on morphology changes across the river section and along the river at higher spatial resolution than a 1D model. The 3D baroclinic modeling (considers density effects on flow) will be applied to examine sub-regional scale hydrodynamic and sediment processes that are influenced by salt wedge formation within the lower river, in the region where salinity intrusion is important. High resolution 3D baroclinic/barotropic, hydrostatic and non-hydrostatic modeling also will be demonstrated for local, project scale applications focused on examining the influence of a project on navigation, flood control, and morphology within the river.

Implications:

An ensemble of numerical flow models are setup for the LCA Mississippi River Hydrodynamic and Delta Management Study to fully understand the riverine, deltaic, and receiving basins systems, and assess the cumulative impacts of proposed restoration strategies while maintaining the flood control and navigation uses. This study will investigate the restoration strategies outlined in the Louisiana Comprehensive Master Plan for a Sustainable Coast (2012). The models will provide quantitative estimates on the potential impacts of restoration strategies on flow and sediment parameters within the river channel, as well as the land building potential, and impacts on the receiving basins.

Barrier Islands and Shorelines II (Room 252)

Moderator: Mark Hester
University of Louisiana at Lafayette

The Chandeleur Islands Oil Spill Mitigation Sand Berm: 1 Year Later

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The *Deepwater Horizon* oil spill occurred in the Gulf of Mexico on April 20, 2010 and within two weeks oil was observed along the shoreline of the Chandeleur Islands located east of the Mississippi River delta. The State of Louisiana requested emergency authorization in May 2010 to construct a sand berm (E-4) seaward of the islands to protect the mainland wetlands from the impact of the oil. Construction of the berm began in June 2010 and continued through March 2011, long after the MC252 well had been capped (July 15, 2010) and observations of surface oil within the Gulf had ceased (August 2010). In its post-construction form, the berm extended along the submerged axis of the northernmost Chandeleur Island platform (detached from the islands) for approximately 8 km and then joined the island shoreface for an additional 6 km. To construct the berm, sediment was excavated from the submerged northern extension of the island platform (Hewes Point). Comparison of pre and post-construction bathymetric surveys reveals that a 1.5 km2 borrow area 4.5 km north of the berm produced 3.5x106 m3 of sediment, not all of which went to or was retained in the berm. This sediment is primarily well-sorted fine sand with little shell material and is texturally distinct from the island sediments. The E-4 berm was engineered as a temporary structure, and underwent significant change both during and since construction. Despite a relatively uneventful tropical cyclone season and few significant winter cold-fronts, aeolian processes and wave overwash have reduced elevation, dissected the berm at numerous locations and decreased subaerial extent. In general, segments of the berm are evolving into distinct morphologies that have direct correlation to the proximity and state of the natural islands and platform. Using satellite imagery, lidar topography, bathymetric investigations, sediment samples, and numerical modeling, this presentation provides an overview of the evolution of the berm since construction.

Implications

The Chandeleur Islands are a natural resource that provide habitat for a variety of threatened wildlife species, recreation, and storm protection for interior environments and human population. The islands are increasingly unable to recover from storm-induced breaching and erosion through the natural redistribution of sediment. The fate of the islands has been the focus of intense study by the U.S. Geological Survey (USGS) and collaborators over the past decade. Through continued monitoring of the Chandeleur Islands and the E-4 berm, the USGS hopes to answer fundamental questions about how climate and geologic variables influence the present and future morphology of coastal systems. The study also evaluates the berm as a potential proxy for short-term shoreline response to large-scale revitalization projects. Understanding the physical interactions that drive coastal evolution provides a framework of knowledge for effective management of coastal planning and protection.

Evaluation of Techniques to Enhance Plant Establishment at Barrier Island Dune and Swale Restoration Sites

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Successful restoration of barrier islands and other sandy coastal habitats requires the establishment of viable and sustainable plant communities. The rapid establishment and expansion of vegetative cover is crucial in trapping and binding sand, thereby increasing resilience to storm and overwash events. Humic acid has been reported to ameliorate the impacts of environmental stressors associated with growing crops in marginal soils; however, literature on the potential benefits of humic acid in coastal restoration is extremely limited. In these studies we investigated the potential benefits of humic acid amendment, increased planting density, and broadcast fertilization in an interactive fashion on the establishment success and expansion on key barrier island plant species.

Our initial investigations utilized a series of greenhouse experiments on an array of barrier island plant species in conjunction with a large-scale field experiment conducted at the Whiskey Island barrier island restoration project site (TE-50). Both greenhouse and field experiments revealed differential species responses to restoration techniques. The field component focused on a subset of these species that were planted at the site: sea oats (*Uniola paniculata*), bitter panicum, (*Panicum amarum*), and marshhay cordgrass (*Spartina patens*). All species demonstrated positive responses to nutrient augmentation via broadcast fertilization. Overall, humic acid amendment showed limited benefits that varied by species. Sea oats displayed benefits from humic acid amendment under low-density, unfertilized conditions, whereas marsh-hay cordgrass showed the greatest benefit under high-density, fertilized conditions.

A currently-accepted restoration strategy in Louisiana barrier island restoration projects is broadcast seeding of coastal Bermuda grass (*Cynodon dactylon*). This is assumed to rapidly establish an ephemeral, sand-stabilizing species prior to planting the target dune and swale species (sea oats, bitter panicum, and marshhay cordgrass). However, results from this study indicate that Bermuda grass may be hindering dune building by restricting aeolian sand transport to the dune zone. This effect was amplified with nutrient addition since it increased the vigor and persistence of Bermuda grass. There was also evidence of Bermuda grass competing with marshhay cordgrass and other subordinate swale plant species under fertilized conditions. Therefore, we recommend that barrier island restoration practices are carefully evaluated for compatibility with project goals before Bermuda grass broadcast seeding is implemented as a component of the restoration.

Implications

A broadcast fertilization regime improved the rate of vegetation expansion of both sea oats and bitter panicum, and to a more limited extent, marshhay cordgrass. Doubling the density of transplants was most beneficial to marshhay cordgrass and especially sea oats establishment success and expansion. The benefits of humic acid amendment were evident under certain conditions, such as enhancing marshhay cordgrass performance when fertilized and competing with coastal Bermuda grass. The practice of broadcast seeding coastal Bermuda grass to stabilize sand prior to transplanting target species should be reevaluated since there is evidence that it may interfere with sand movement to the sand fencing, thereby limiting the height of the dune that can develop. Regardless of restoration enhancement techniques employed, the quality of the transplants and the timing and amount of precipitation post planting remain extremely influential determinants of dune and swale planting success.

Development of a Dynamic Sediment Budget to Predict Future Shoreline Positions on a Sand Limited Shoreline in Cameron Parish, Louisiana

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A dynamic sediment budget was developed along the shoreline of the Chenier plain in southwestern Louisiana in an attempt to forecast future shoreline position and to determine the performance of a proposed beach nourishment project along the shoreline which extends 14 km west of the western jetty of Calcasieu Pass, Louisiana and runs through the community of Holly Beach, Louisiana. The majority of the shoreline is composed of either bare silty clay with no sand or a thin veneer of sand perched on a muddy bottom. The project site is currently experiencing shoreline retreat rates ranging from 1.5 m/yr to 10 m/yr, with erosion threatening local public and private infrastructure in addition to more than 160 square km (40,000 acres) of freshwater wetlands.

Observations of shoreline morphology revealed a solitary sediment wave traversing the project site from east to west since the 1960's. The genesis of the sediment wave is unknown and is unexplored in this work, but is hypothesized to exist due to an overall sediment deficit along the shoreline. The presence of the sediment wave masked the long-term shoreline change rates along the project site, and therefore biased the predictions of future shoreline change rates due to the transient nature of the sediment wave morphology and long translation time scale.

Standard coastal engineering methods used to predict future shoreline positions include simple translation of the shoreline based on measured shoreline change rates (referred to herein as historical linear progression or HLP) and one-line numerical models. For the project site, due to the presence of this sediment wave the simplified HLP approach to predict future shoreline positions is not applicable. One-line shoreline morphology models such as the US Army Corps of Engineer's GENESIS model require the assumption that the beach profile can be represented by an equilibrium beach profile which is developed for sand rich shorelines. The project site profile composition of a sandy veneer extending to a depth of approximately -1.2 to -2 m over a muddy bottom violates this assumption, and therefore the traditional one-line model cannot be applied.

Therefore, a dynamic sediment budget (DSB) method was developed to predict future shoreline positions based on available historical data, longshore transport rates, known morphological processes, statistical estimates of storm events, beach nourishment diffusion, and a relationship between volume change and shoreline change based on existing profile composition. The morphology of the sediment wave was quantified (amplitude, wave length, and translation speed as a function of time), which allowed for the isolation and separation of the influence of the sediment wave on the long-term shoreline change rate.

The DSB was validated by reproducing measured historical shoreline change rates from 1988 to 2008. The validation results showed that the DSB was able to compute the shoreline morphology over the 20 year period from 1988- 2008 well, and was able to approximate the 2008 shoreline within the margin of error of the measured data. Therefore, it was determined that the DSB is a valid method for computing future shoreline morphology.

Implications

The dynamic sediment budget can be used as an effective tool for prediction of future shoreline positions along the coastal Louisiana where a majority of the coastline is characterized by either bare silty clay with no sand or a thin veneer of sand perched on a muddy bottom and also where influences of a moving sediment wave masks the actual background shoreline change rates making it difficult to use the traditional one-line models or HLP techniques for predicting future shoreline positions. The dynamic sediment budget can be used to predict and compare future shoreline positions with and without beach nourishment projects and can serve as an excellent utility for designing beach nourishment projects in sand limited environments.

Concurrent Session III

Monday, June 25 3:30-5:00

Landscape Restoration (Room 257)

Moderator: Eric Held
Ducks Unlimited

Coastal Planning In The United Kingdom

***David Dales*[1]*,* *Tara-Leigh Eggiman*[1] *and Jonathan Short*[1]
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The paper describes recent developments in coastal planning in the United Kingdom (UK), illustrating key themes through project examples, and describes lessons learned and implications.

Key Aspects of UK practice

- A two-tier cascade of plans – the roughly 3000-mile UK coastline is covered by 30 'Shoreline Management Plans' which set policy at the highest level.

- The time horizon – each Plan and Strategy has a total time horizon of 100 years divided into 3 'epochs', epoch 1 being the first 20 years, epoch 2 the next 30 years, and epoch 3 the last 50.
- Guidance on sea level rise - nominally 800mm over 100 years
- A legal requirement for assessing and mitigating impacts on environmentally designated sites – a precautionary approach has been adopted, even in epoch 3.

Lessons learned

- Localism versus central approval – there is a tension between the aim of the UK government to empower local communities and the need for coastal planning to extend beyond the immediate narrow interests. The Plan developed by URS for 180km of the east coast of England was based on decision-making by consensus of all parties. This bold approach has some difficulties but has delivered a widely-accepted, highly strategic vision.
- Prioritisation - prioritisation of projects within an overall programme with restricted funds requires a rigorous, transparent framework if public support is to be achieved
- Epochs – the system of epochs has proved a major success. The URS Plan solved some difficult issues by allowing communities to use epoch 1 to adapt to new policies. However, the application of the precautionary approach on environmental issues in Epoch 3 has proved near impossible to make work, due to the uncertainty involved 50-100 years out.
- Difficulties in tackling large projects, e.g. proposals for tidal power generation on the Severn and Mersey Estuaries – the planning system has not worked well for these type of projects due to the extreme cost required to assess impacts in detail.
- Guidance on sea level rise – The URS work on assessing inundation risk has found that small changes in projected sea level can lead to very different outcomes and drive a need for a flexible Strategy.

Implications

The paper will discuss implications of these issues for coastal planning, in the UK and for Louisiana's restoration programme

- Decision making needs a clear framework. In particular, clarity at the outset is needed on the geographical scale at which decisions will be made, and on the methods for making decisions on contentious subjects with diverse technical, legal, environmental and social aspects;
- Given limited funding, the method for prioritising projects must be clear, and transparently aligned to the objectives of the implementing authority and to the needs of the public
- Project assessment needs to take a view on how uncertainty regarding sea level rise and climate change, and impacts on the environment, will be dealt with. The use of an 'epoch' type approach can be a powerful aid to long-term planning, allowing phased adaptation.

Floodplain Conservation in the Mississippi River Valley – Combining Spatial Analysis, Landowner Outreach, and Market Assessment to Enhance Land Protection in the Atchafalaya River Basin, Louisiana.

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Floodplain conservation is complicated by the fact that threat sources for riverine landscapes are often the result of system-wide river management policy, located far from where the threats appear, or both. Because of these complicating factors, conserving and restoring floodplains must often involve systemic solutions. This systemic-solution model has shifted the rationale for land protection, defined as land and land rights acquisition, from one traditionally aimed at preserving high-quality examples of important habitat (i.e. rainforest, grasslands, beaches and dunes, temperate forest, coral reefs), with more localized threat sources (i.e. deforestation, development), to one where acquired land must also have multiple and systemic threat abatement benefits in relation to disjunct regions.

The Mississippi River Flood of 2011 highlighted the value of floodplain storage for protecting people and infrastructure. This major event illustrated that increasing the number of dedicated floodplain complexes along the Mississippi River can provide systemic benefits for nature and people. Well managed floodplains create flood storage capacity and, at the same time, provide more large areas of conserved and/or restored floodplain forest that provide fish and wildlife habitat, nutrient removal, and carbon sequestration. The 2011 Flood caused extensive strain on the entire Mississippi River and Tributary (MR&T) levee system. To manage water discharges of this magnitude, existing floodways in the MR&T system were successfully used to divert water from the Mississippi River, lower stage, and relieve strain on main stem levees near heavily populated areas. The Atchafalaya River Basin (ARB) in Louisiana was the site of two floodways that were used to reduce stage along the lower Mississippi River. The ARB is also a high-value conservation target in Louisiana and the entire Lower Mississippi River Valley, due to possessing a globally significant forested wetland system with associated coastal marshes. Therefore, this basin provides an excellent example which demonstrates that land protection can provide systemic threat abatement, and, at the same time, advance conservation.

We used a combination of spatial analysis, landowner outreach, and market assessments to enhance land protection prioritization and planning for the Atchafalaya River Basin. Spatial analyses identified six discrete priority conservation areas (77,084 ha [190,500 ac], approximately 23% of which consisted of forested wetlands and water bodies) to serve as the initial focal area for future land protection within the floodway. Landowner outreach (mail out surveys and telephone interviews) found strong support (> 80% of landowners contacted) for land protection within the floodway, and market assessment techniques established land values and price points for forest conservation. The ultimate goals of this effort are to enhance congressionally-authorized land protection work already done by the U.S. Army Corps of Engineers and to enhance conservation of ARB lands by developing and applying higher levels of easement restrictions via financial incentives to landowners.

Implications

This research provided important ecological and socio-economic information for protecting valuable coastal forest land in Louisiana. It will enable future land protection by targeting interested landowners in priority areas of the basin.

Coastal Watershed Management: A Case Study Monitoring Bayou Teche

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The role of nutrient enriched discharge from coastal watersheds is often overlooked in near-shore coastal waters due to the prevalence of Mississippi River discharge in the Northern Gulf of Mexico. This presentation will explore the role of monitoring programs of costal tributaries and their watersheds using a case study approach from Bayou Teche. UL Lafayette and the Louisiana Department of Environmental Quality have recently developed a comprehensive whole-basin monitoring program for the Bayou Teche watershed, it's tributaries and distributaries, assessing concentrations of non-point source pollutants. Development and implementation of the watershed monitoring plan will be presented with lessons learned for future programs. Long-term trend analyses are being developed to compare historical and current concentration and flux estimates from the basin. Research efforts in conjunction with the monitoring program were developed simultaneously to determine statistical and spatial correlations between water quality parameters and land use patterns by sub-basin. Preliminary results of this monitoring effort will be presented along with hypotheses of land use patterns that drive observed water quality trends.

The hydrology of Bayou Teche is highly altered and complex. The construction of the West Atchafalaya Guide Levee severed the flow of Bayou Courtableau, which connected the Atchafalaya River and Bayou Teche during periods of high water. The Teche-Vermilion Freshwater District (TVFD) was created to simulate this natural connection between Bayou Teche, Bayou Vermilion, and the Atchafalaya River. Water from the Atchafalaya River is now manually pumped on a consistent basis into the watershed to maintain sufficient flow through the Teche-Vermilion system in an effort to reduce stagnate conditions along Bayou Teche and Bayou Vermilion which are connected by two channels, Bayou Fuselier and Ruth Canal. Bayou Teche and Bayou Vermilion are, therefore, distributaries of the Mississippi-Atchafalaya River Basin. With the construction of Wax Lake Outlet, the natural discharge of Bayou Teche into Vermilion Bay was severed and the effective 'mouth' of the bayou is now Charenton Drainage and Navigation Canal which flows into the Jaws of West Cote Blanche Bay, the site of a CWPRRA Project, Sediment Trapping at The Jaws, a large-scale terracing restoration project.

Several urgent questions are the object of this study. To what degree is non-point source loading attributed to local runoff versus the Atchafalaya River? Where should we focus management efforts to improve water quality in Bayou Teche and coastal waters? Can we quantify a correlation between land use practices in Bayou Teche watershed, in-stream processes, and nutrient export into the Jaws of West Cote Blanche Bay? Can natural bayou conditions on the coastal plain assimilate high nutrient conditions from Mississippi-Atchafalaya River water? What are the effects of high nutrient export in shallow coastal waters, and what are the implications for terraces and other coastal restoration projects in their receiving basins?

Implications

The altered hydrologic framework of tributaries and distributaries in the Teche-Vermilion watershed complicate land use policy and land management efforts towards improved water quality and coastal restoration. Further research and long-term monitoring efforts will be necessary to 1) identify decadal trends in nutrient fluxes, 2) improve in-stream water quality, 3) assess the impact of coastal watersheds on estuarine and wetland processes in Louisiana's coastal zone, and 4) determine the ability of coastal distributaries to assimilate non-point source pollutants from Mississippi-Atchafalaya diversion efforts.

Hurricanes and Wetlands (Room 255)

Moderator: Amanda Moore
National Wildlife Federation

Wave Attenuation by Saltmarsh Vegetation in Terrebonne Bay during Tropical Storm Lee

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It is generally acknowledged that the coastal wetlands provide a natural first line of defense against approaching storm surge and waves. By one estimate, in the US, the coastal wetlands were estimated to provide $23.2 billion in storm protection services annually. In addition to the traditional methods of protection from the storm surge and waves, use of coastal wetlands to reduce the impacts of hurricanes has regained interest among the coastal engineers and policy makers. However, there is a paucity of field measurements of wave attenuation by vegetation and no such data exists for high wave energy conditions such as those produced during a tropical storm. To measure attenuation of storm-induced waves by wetland vegetation, wave gages were deployed during Tropical Storm Lee when it made on September 3, 2011 on the Louisiana coast. The gages were deployed in the upper marsh of Terrebonne Bay which is a shallow estuary (1-3 m depth) on the west side of the mouth of the Mississippi River.

Wave data were measured along a 45 m transect using 4 pressure transducers in the marsh and one in the open water over a two day period. The tropical storm force winds produced waves up to 0.8 m in the open water adjacent to the marsh. As the waves landed on the marsh and propagated over the vegetation submerged under 1m of surge, the wave heights were reduced by 50% in the first 15 m from the marsh edge. Within 60 m from the marsh edge, the wave heights were reduced to 80% of those in the open water. Low-frequency low-energy ocean swell waves were observed to reach the study site which is 15 km inwards from the barrier island chain. Measured wave spectra were largely bimodal consisting of low-frequency swell (7-10 s) and high-frequency (2-4.5 s) wind seas.

Measured wave heights, energy losses between gages and spectral energy dissipation models were utilized to estimate wave decay rates and drag coefficients induced by the vegetation. Incident waves attenuated exponentially over the vegetation. The exponential wave height decay rate decreased as Reynolds number increased. The larger waves decayed at a slower rate than the smaller waves with a similar frequency. By contrast, the swell was observed to decay at a slower rate than the wind sea. The linear spatial wave height reduction rate increased from 1.5% to 4% /m as incident wave height decreased. The estimated drag coefficient reduced with increasing Reynolds and Keulegan-Carpenter numbers. The corresponding empirical power law equations exhibit much smaller (<1) exponents than the exponents (~3) of the similar empirical relations for low-energy environments. The coefficients of the empirical relation were found to depend on the dominant frequency of the random wave field. Previously, such empirical relations were suggested to vary primarily with the vegetation parameters. This is the first reported study with comprehensive measurements of wave attenuation due to wetland vegetation under high wave energy conditions generated by a tropical cyclone.

Implications

Hurricane induced surge and waves cause loss of human life and damage to property in coastal Louisiana. The traditional hard-structure methods of hurricane protection can be costly and unsustainable, and may cause unintended ecosystem consequences by disturbing the deltaic processes. The storm mitigation value of coastal wetlands has always been considered as a soft-structural approach. However, currently no reliable predictive tools exist that accurately quantify the magnitude of storm surge and wave reduction by wetlands vegetation. This study quantifies storm wave reduction for the first time with accurate measurements on wetlands in Louisiana. Additionally, the study develops empirical relations to determine drag coefficient which is an important parameter in the numerical models of hurricane induced surge and waves. These numerical models are routinely applied to predict surge and waves ahead of storm for emergency preparedness and for coastal resource management. Accuracy of these models is enhanced when proper drag coefficients are applied.

Wetland Loss Associated With Hurricane Storm Surge Near the Caernarvon Freshwater Diversion

***Pat Fitzpatrick*[1]**, *Sachin Bhate*[1], *Yee Lau*[1], *Valentine Anantharaj*[1†], *Suzanne Shean*[2], *Kelin Hu*[3], *and Qin Chen*[3]
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This study quantifies the land loss in saline, intermediate, and freshwater wetlands in the vicinity of the Caernarvon freshwater diversion due to the impact of hurricanes in 2005 and 2008. This analysis is performed using data from NOAA's Coastal Change Analysis Program (C-CAP) program, and from the Landsat 5 Thematic Mapper (TM) satellite sensor. Mean water coverage was determined in eleven Areas of Interest throughout the region, and statistical significance Wilcoxon rank-sum tests were calculated for water coverage change before and after the hurricane periods. It is shown that wetland loss is proportionally largest in the freshwater regions near the diversion at statistically significant levels. These results are consistent with other recent studies which postulate that the low salinity marshes near Caernarvon are more vulnerable to hurricanes due to their shallower rooting in organic soil, in contrast to the deep-rooted mineral substrate of saline marsh further east and north from the diversion. An integrated storm surge and wave numerical model shows no wave amplification near the diversion for either hurricane period, confirming that the enhanced wetland loss near Caernarvon is related to soil issues.

Implications

These results support a growing body of evidence that freshwater diversions, while promoting biodiversity, may also be enhancing Louisiana's wetland loss in certain regions due to a lack of hurricane-resilience. This paper proposes that freshwater diversions' hydrological framework need to be re-examined to counter frequent tropical cyclone strikes. Studies are encouraged regarding soil substrate, nutrient loads, erosion protection, replanting/restoration efforts, and sediment distribution (either through redistributed flows, containment structures, dredging, or sediment pipes).

This work also suggests that the negative perception of saltwater intrusion in wetland restoration be re-examined. An assessment of wetland resiliency is important before freshwater is reintroduced into an area. Established saline vegetation may withstand hurricane impacts better than developing freshwater aquatics in organic soil. The Biloxi Marsh is an example of a stable saltwater marsh environment that adjusted to habitat change from MRGO's saltwater intrusion, and survived the hurricanes of 2005 and 2008 relatively intact.

Historical Hurricane Impacts on Coastal Wetlands: Contributions of Extreme Storms to the Development of the Coastal Louisiana Landscape Over the Past Century

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Historical aerial photography and topographic maps were used to identify extreme hurricane impacts within coastal Louisiana wetlands from the 1930s through the 1970s. Hurricane magnitude, track, landfall location, storm surge measurements, and coastal orientation were used to identify probable storm impact areas. Temporally and spatially repeated patterns of wetland erosion and deformation were observed for seven hurricanes from the 1940s through the 1970s. Extreme historical storms causing significant coastal erosion include the 1947 Fort Lauderdale Hurricane, Hurricane Audrey (Jun 27, 1957), Hurricane Hilda (Oct. 4,1964), and Hurricane Betsy (Sept. 9, 1965). These storms produce distinctive diagnostic morphological wetland features that are the products of the coupling of high-velocity wind and storm-surge water and their interaction with the underlying, variably resistant, wetland vegetation and soils. Erosional signatures include construction of orthogonal-elongate ponds and amorphous ponds, pond expansion, plucked marsh, marsh denudation, and shoreline erosion. Post-storm floodwater draining from the wetlands forms dendritic incisions around the pond margins and locally integrates drainage pathways forming braided channels. Depositional signatures include emplacement of broad zones of organic wrack on topographic highs and inorganic deposits of variable thicknesses and lateral extents in the form of shore-parallel sandy washover terraces and interior-marsh mud blankets. Deformational signatures primarily involve laterally compressed marsh and displaced marsh mats and balls. Prolonged water impoundment and marsh salinization also are common impacts associated with wetland flooding by extreme storms.

The erosional wetland features from historical storms, particularly those located in non-fresh wetlands, generally did not recover with time over the past 80 years. Localized areas may contain episodic land loss caused by multiple storm impacts that locally influence subsequent storm-induced morphological changes. The distinctive morphology of orthogonal-elongate ponds and amorphous ponds were also used to identify likely hurricane-induced land loss prior to the start of the remote sensing record in the 1930s. Stable, low subsidence, coastal areas contain a surficial record of cumulative storm-impacts likely dating back a century or more whereas these impacts are subsumed into regional land loss patterns in deteriorating high subsidence areas. Hurricane-induced wetland erosion is often the dominant process contributing to wetland loss in stable coastal areas and will accelerate wetland loss in deteriorating areas. Cumulative extreme storm impacts create wetland loss at regional scales at varying temporal frequencies. Distinguishing between wetland losses caused by storm impacts and losses associated with long-term delta-plain processes is critical for accurate modeling and prediction of future conversion of coastal wetlands to open water.

Implications

Hurricanes do contribute to coastal accretion but this review of historical hurricane impacts coupled with wetland loss identified by recent extreme storms shows that hurricanes, both individually and cumulatively, serve as wetland loss accelerators that contribute significantly to wetland loss and the shaping of the modern coastal landscape. Extreme historical hurricanes, such as Audrey, caused internal wetland losses similar in magnitude and distribution to those observed from Hurricanes Katrina and Rita. Identification of wetland loss caused by individual historical storms provides knowledge of potential wetland loss from future storms. Cumulative hurricane-induced wetland loss dominates some coastal areas. Knowing the recent evolution of these storm-formed landscapes may improve potential wetland restoration strategies for these areas.

Dredge Sediment Management (Room 253)

Moderator: Barbara Keeler
EPA Region 6

The Louisiana Coastal Area (LCA) Beneficial Use of Dredged Material (BUDMAT) and Demonstration Projects Programs, US Army Corps of Engineers Perspective

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Authorized by the Water Resources Development Act of 2007, the $1.996 billion Louisiana Coastal Area Program (LCA) is a systematic approach to restore natural features and processes of the Louisiana coastal ecosystem. The LCA Program includes 15 critical, near-term ecosystem restoration projects, the Beneficial Use of Dredged Material (BUDMAT) Program, and the Demonstration Projects Program.

The Corps' operations and maintenance (O&M) program in South Louisiana dredges an average of 64 million cubic yards of material annually. Approximately 45 to 50 percent of the available and suitable dredge material is currently used beneficially under the O&M program. The $100 million LCA BUDMAT Program is intended to increase the beneficial use of dredged material in coastal Louisiana. The BUDMAT program specifies procedures to solicit, screen, plan, design and construct ecosystem restoration projects using dredged material beneficially. Funds from the BUDMAT Program would be used to plan, design, and construct (fund disposal activities) ecosystem restoration beneficial use projects associated O&M channel maintenance dredging activities.

The Demonstration Projects component of the LCA Program acknowledges the need to resolve critical engineering, technical or/and biological uncertainties associated with large-scale restorations projects. When at all possible, Demonstration Projects should also provide meaningful restoration benefits. The program is authorized for $100 million, with the total cost of any project not to exceed $25 million.

Within the Demonstration program, the Corps and the State of Louisiana have developed a framework for identifying critical uncertainties, and developing a suite of candidate demonstration projects aligned with those uncertainties. From the suite of aligned projects, selected Demonstration Projects are being advanced through feasibility and design, to be positioned to initiate construction upon receipt of Federal construction funds.

Implications

The BUDMAT Program takes greater advantage of existing sediment resources from maintenance dredging activities of authorized Federal navigation channels to achieve restoration objectives in coastal Louisiana, while ensuring that all beneficial use projects implemented under the program are cost-effective and contribute towards the overall goals of ecosystem restoration in coastal Louisiana.

The LCA Demonstration Projects reflect a consensus among knowledgeable professionals of the critical uncertainties that require resolution to inform development of LCA restoration projects to optimize restoration benefits. Projects are selected to yield information/lessons learned to inform project teams, whether engaged in PED, construction or the adaptive management of constructed coastal restoration projects.

This presentation focuses on an overview of the BUDMAT and Demonstration Projects Programs and highlights efforts to enable initiation of construction as early as 2013.

Mississippi River Long Distance Sediment Pipeline: Opportunities and Constraints

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Reestablishing natural pathways through freshwater diversions from the Mississippi River into neighboring marshes is and has been a cornerstone of the State of Louisiana's comprehensive plan for a sustainable coast. The rate of sediment supply through these pathways, however, is relatively slow and will take years before discernible marsh building is realized. The rapid loss of wetlands requires the implementation of more rapid and aggressive restoration strategies to get sediment back to the marshes. The Long Distance Sediment Pipeline (LDSP) project offers opportunities for supplying large, marsh building quantities of sediment from Mississippi River borrow sites to distant areas within the basin. With a finite budget the project intent for the LDSP to extend as far west into the Barataria basin as possible predicates the need for a linear, low narrow marsh platform corridor that optimizes the volume of sediment required to achieve maximum distance. The first increment of the project involves construction of a linear marsh platform corridor with associated marsh fringe creating almost 400 acres of wetland over the 13.5 mile corridor using approximately 3.3 million cubic yards of river sediment. This presentation will focus of the opportunities that the LDSP provides to improving the delivery of marsh creation projects, often at locations remote from the sediment source as well as looking at the constraints that the LDSP project has to address.

Opportunities:
By linking the alignment of existing and relic natural ridges with the footprints of existing and proposed projects, this project provides a means to re-establish a contiguous reach of emergent wetlands along the Barataria landbridge. By using renewable sediment resources sustainably mined out of the Mississippi River, large volumes of sediment can be placed back into the system in strategically locations, rather than the conventional and unsustainable redistribution of existing sediments within the basin. In contrast to conventional project-by-project mob/demob bidding strategies, by sequencing future marsh creation projects the LDSP can synergistically construct multiple projects along a common corridor alignment with a single sediment delivery system with significant potential savings in over-all construction costs of these individual projects of between $160-$200-M. Similarly, LDSP provides a single access corridor that minimizes the incremental and cumulative future environmental impacts associated with individual restoration projects that dredge water bodies for pipeline conveyance.

Constraints:
A common misconception is that sediment supply in the Mississippi River is an infinite resource and that these borrow sites are fully replenished on an annual basis. Morphological modeling of the borrow sites suggests that the borrow sites actually require 2 to 4 years to fully recover, (depending river flows, cut volume, and cut depth), a finding confirmed with borrow area recovery rates observed at the Alliance Anchorage borrow site after construction of the BA-39 project.
As marsh creation projects are built with increasing distance from the Mississippi River, future projects will be required to cross existing or newly restored projects. Accommodating the production rates of typical dredge operations with agency concerns to minimize footprints across existing healthy marsh and in particular newly restored marsh is a highly complex consideration and requires design and agency cooperation.

Implications

While a LDSP project does not restore the natural cycle of sediment deposition from seasonal floodwater flow, it does provide a mechanism to achieve a similar result (i.e. transporting sediment from the Mississippi River to the coastal marsh ecosystems presently cut off by levees)..Using sediment dredged from renewable borrow areas within the river will allow for more aggressive restoration time scales than the surrogate freshwater and sediment surrogate diversion pathways intended to mimic natural sediment introduction processes. The LDSP offers the best opportunity and most cost effective approach to place large volumes of sediments within the Barataria Basin. Transport of large volumes of sediment over long distances occurs at a premium, with unit costs increasing with distance. However, the LDSP still remains the most cost effective method to place such large volumes of sediment at these critically degraded site locations often many miles away from sustainable sediment resources.

Riverine Sand Mining / Scofield Island Restoration Project (BA-40)

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Scofield Island is located west of the active Mississippi River bird's foot delta in Plaquemines Parish, Louisiana. The island has experienced substantial impacts from storms, relative sea level rise, and anthropogenic influences. The combined effects have caused landward transgression, island breaching, wetlands loss and adverse impacts to fisheries.

Previous restoration efforts on barrier headlands in Louisiana have utilized offshore sediment sources for restoration. With depletion of the readily available beach compatible offshore sediment sources, a primary objective of this project is the mining and transporting of sediments from the Mississippi River for beach and dune restoration; a first in our nation's history. Prior studies had identified multiple existing sand deposits in the river within a reasonable transport distance to Scofield Island. A screening analysis was performed to evaluate the various deposits. Parameters examined included sand volume, grain size, transport distance, navigation crossings and safety issues, and proximity to existing revetments and anchorages. The results of the screening analysis identified two viable borrow areas containing approximately 3.8 million and 4.6 million cubic yards of sediment each.

Several sediment conveyance corridor alternatives were evaluated for feasibility. These included the utilization of the Empire Waterway, a 10-mile navigational corridor extending from the Mississippi River to the Gulf of Mexico, then south to Scofield Island using barges or pipeline; transport of sediments by barge to the mouth of the Mississippi River and along the coast to Scofield Island; and installation of a pipeline via a direct route from the Mississippi River through the fragmented marsh and open bays to Scofield Island. Results of an alternative analysis demonstrated that use of the Empire Waterway with a sediment delivery pipeline was the preferred alternative having the fewest environmental and construction duration impacts.

Construction of the beach/dune fill template will require approximately 20 miles of pipeline and 4 booster pumps. The pipeline will cross two hurricane protection levees, cross underneath two highways, and traverse the Empire Waterway, and then proceed south in the Gulf of Mexico to Scofield Island. Marsh-compatible fill sediment will originate from an offshore borrow area within 3 miles of the island and be transported by pipeline to the fill template.

In an effort to restore estuarine and island geomorphic and ecological form and function, Louisiana is proceeding with construction of approximately 238 acres of beach and dune and 398 acres of marsh platform. The dune, supported by sand fencing, will be 6 ft high and approximately 640 ft wide along 11,400 ft of gulf shoreline. Retention dikes required for construction will be gapped to ensure marsh platform tidal exchange. The dune and marsh will be planted with native plants, including black mangroves. The Project benefit, over 636 created acres, will maintain and mature to approximately 434 acres of barrier island and wetland habitats at year 20 of the design life.

Construction of the project is anticipated to begin in the Spring of 2012 with completion by the Summer of 2013.

Implications

Demonstrate the ability to utilize renewable riverine sand deposits in the Mississippi River for Louisiana barrier island restoration. Demonstrate the ability to convey large volume of sediment over great distance via sediment delivery pipeline through use of the Empire Waterway. This will provide valuable information to coastal managers for planning of future coastal restoration including interior marsh and wetland restoration projects.

Community Resiliency (Room 252)

Moderator: Happy Johnson
National Wildlife Federation

Governmental Laws, Rules and Policies, Are They Keeping Up With Coastal Restoration Objectives

Kenneth G. Ammon[1]

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From local construction impact and inspection fees, through regional, state and federal wetland mitigation requirements, to construction and operational constraints imposed by the Endangered Species Act (ESA), twenty-first century environmental restoration projects are subjected to laws, rules and policies (LRP's) that in most cases were historically formulated to offset impacts caused by commercial, industrial, residential and agricultural activities. Few of these LRP's have been re-addressed to consider the cumulative societal costs, overwhelming ecosystem benefits and the need for consistent and reliable operations of environmental restoration projects.

While some local governments insist on impact fees based on a percentage of construction, others have actually held project canal and right of way easement transfers hostage until these fees have been paid or other demands have been met. These types of issues should be addressed by the state through encompassing legislation pertaining to environmental restoration projects.
A holistic regulatory approach needs to be formulated by local, state and federal authorities as to the uniqueness of environmental restoration projects as compared to other development activities. The same taxpayers are ultimately funding these projects at four levels government, local, state, regional and federal, so maximizing benefits and minimizing costs needs to be integral in revisions to governmental LRP's. While there has been some very positive policy interpretation progress primarily through the Army Corps of Engineers, Civil Works Attorney's office, this progress has primarily involved clarification of general policies with room for interpretation vs. laws and rules which are much more rigid. Part of our charge in minimizing costs should be to reduce regulatory hurdles, reduce planning timeframes and provide more implementation flexibility such as consistency between federal vs. local sponsor regulatory requirements.

Likewise, there is a clear expectation of operational performance for each project from a quantity, quality, timing, distribution and seasonal delivery perspective, including a congressional expectation to the same in the case of Everglades Restoration that has proved to be elusive. The reliability of operations which drives the environmental benefits of the projects can be compromised because once completed, many are attractants to endangered species and migratory birds for which current LRP's require a change in project operations to protect. Ultimately these projects provide and overall benefit to both endangered species and migratory birds regardless of operations but proper and consistent operations will provide many more benefits that could be lost if current LRP's are not revised. These other benefits include nutrient reduction, wetland rehydration, flow equalization, groundwater recharge, redistribution, water supply, seepage control, increased wildlife habitat and coastal erosion protection.

These LRP consistency issues should not be viewed as an affront on existing LRP's but simply a recognition that true coastal environmental restoration projects are implemented for the public good, improve our quality of life, provide multiple ecosystem-wide benefits, are paid for by all taxpayers at multiple levels and as such, should have special regulatory status at all levels of government.

Implications

The regulatory hurdles imposed on restoration projects significantly affect the planning, design, construction, operation, maintenance, cost and timing of their implementation. Outdated laws, rules and policies which were originally formulated to constrain and mitigate ecological impacts by proposed residential, commercial, industrial and agricultural interests, have not kept abreast with the public and ecological benefits of restoration projects. The Endangered Species Act, Migratory Bird Treaty Act, Section 404 (wetland mitigation) and Section 408 (flood control) policies, as well as state and local mitigation and impact fee requirements, have detrimental effects on restoration program progress and costs. Joint recognition by regulatory agencies that these restoration projects are self-mitigating, constructed in the public interest and need to be operated as designed, must lead to revisions in law at the federal, state and local levels to reduce public costs and maintain restoration momentum.

How To Make a Resilient Gulf Coast

***Valsin A. Marmillion*[1]**, *Sidney Coffee*[1]
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Scientific studies predict that coastal communities in the Gulf of Mexico will continue to experience increasingly powerful, destructive storms in addition to relative sea level rise driven by land subsidence and climate change. Based on these threats, localized resiliency parameters and action plans are urgently needed that will enable communities to adequately prepare for the future.

The America's WETLAND Foundation's "*Blue Ribbon Resilient Communities*" initiative is helping coastal communities in Texas, Louisiana, Mississippi, Alabama and Florida create resilient futures. Resilient communities have the ability to adapt to and influence the course of environmental, social, and economic change and are critical to the region's long-term viability and success in the face of impending threats from natural and man-made disasters.

The "*Blue Ribbon Resilient Communities*" initiative is assessing local vulnerabilities and empowering each community to envision, plan and act to ensure resiliency and sustain cultural, economic and ecological values. The initiative is strengthening the local voice and providing more authentic solutions for resilient economies, environments, and cultures in the Gulf coastal region.

During this session, we will share the results of 11 community forums held in Louisiana, Texas, Mississippi, Alabama, and Florida during 2011 and 2012. We will reveal findings and recommendations that have resulted from individual interviews, focus groups and facilitated discussions with local stakeholders, community leaders and scientific advisors. While some issues are discrete to particular communities, there are issues common to all that will likely influence policies and actions in the Gulf Coast region.

Implications

America's Energy Coast forums have served as a balanced approach to elevating the issues of the region with authentic and honest dialogue that moves ideas and recommendations forward in an efficient manner. To ensure the local voice in decisions that will likely decide the future of communities in the region, the Foundation and its supporters are dedicated to a process that supports the economic, ecological and cultural viability of the region. As a result of the initiative communities are better prepared to sustain their ecological, economic, and cultural values; reduce risks associated with natural and man-made disasters and vulnerabilities; make decisions and plans based on realistic timelines; and empower them to take decisive actions to ensure a sustainable and prosperous future.

Achieving Stable Communities in an Unstable Landscape: The Louisiana Resiliency Assistance Program

***Jeffrey A. Carney*[1]**, *Angela Lawson*[2]
[1] *Louisiana State University, Baton Rouge, LA 70803, USA*
[2] *Office of Community Development - Disaster Recovery Unit*

Devastation from four massive hurricanes between 2005 and 2008 has forced Louisianans to face the growing challenge posed by an increasingly unpredictable landscape. In urban centers and rural communities alike; land subsidence, sea level rise, wetland loss, and increased storm activity have exposed a false sense of stability that our communities have grown dependent upon. The cost of instability is dramatically affecting our community structures, social institutions, and the continued function of our local and regional economies. We have no choice but to develop adaptable, resilient, and flexible cities, neighborhoods, and rural communities in order to thrive in this landscape.

The State's comprehensive masterplan for a sustainable coast presents a bold response to this challenge. From the statewide to the project scale, the plan has responded to the failures of our traditional methods of structural control and protection with a bold new vision that uses the river to build land. However, the plan is focused primarily on issues of the natural environment and ecosystems economy. Not since the 2007 Louisiana Speaks effort have city and regional planners presented a coherent statewide vision for Louisiana. A robust effort of planning for human systems must be considered alongside the planning for our natural environment.

The LSU Coastal Sustainability Studio's (CSS) Resiliency Assistance Program (RAP) sponsored through the Office of Community Development - Disaster Recovery Unit (OCD-DRU) seeks to expand upon 38 resiliency planning efforts conducted in communities across the state to help build a lasting structure for implementation and a broad regional framework for resilient community planning.

This presentation will discuss the innovative framework that the CSS and OCD-DRU have developed to approach the issues of scale, local characteristics, trans-disciplinarity, implementation assistance, and replicability. Through the development of a website, a series of regional workshops, webinars, best practices, and resources the program is working to build a broad knowledge base of resiliency planning in Louisiana that builds a comprehensive regional framework from the experiences of local planning efforts.

The groundswell of resiliency planning efforts in Louisiana point to a rapidly changing way that people live with their natural environment. For these local efforts to keep pace with our changing landscape we must work towards a broader, more proactive effort of planning at the regional scale. As the state coastal masterplan suggests a paradigm shift in the way that we protect our coast so too must Louisiana transform the way that we plan for resilient, independent communities.

Implications

The Resiliency Assistance Program will provide a significant bridge between the wide range of community planning efforts currently underway in local communities and the large scale changes projected by the State Masterplan. It is essential that specific planning efforts in Louisiana's communities communicate clearly to the regional scale and are able to effect policy and investment decisions state wide and nationally. Additionally, the trans-disiplinary LSU Coastal Sustainability Studio has developed a method to allow our work to communicate across scales and provides a means to help break down the silos that currently divide people working on related issues of resiliency.

Welcome Reception and Poster Session

Monday, June 25 5:00-7:00

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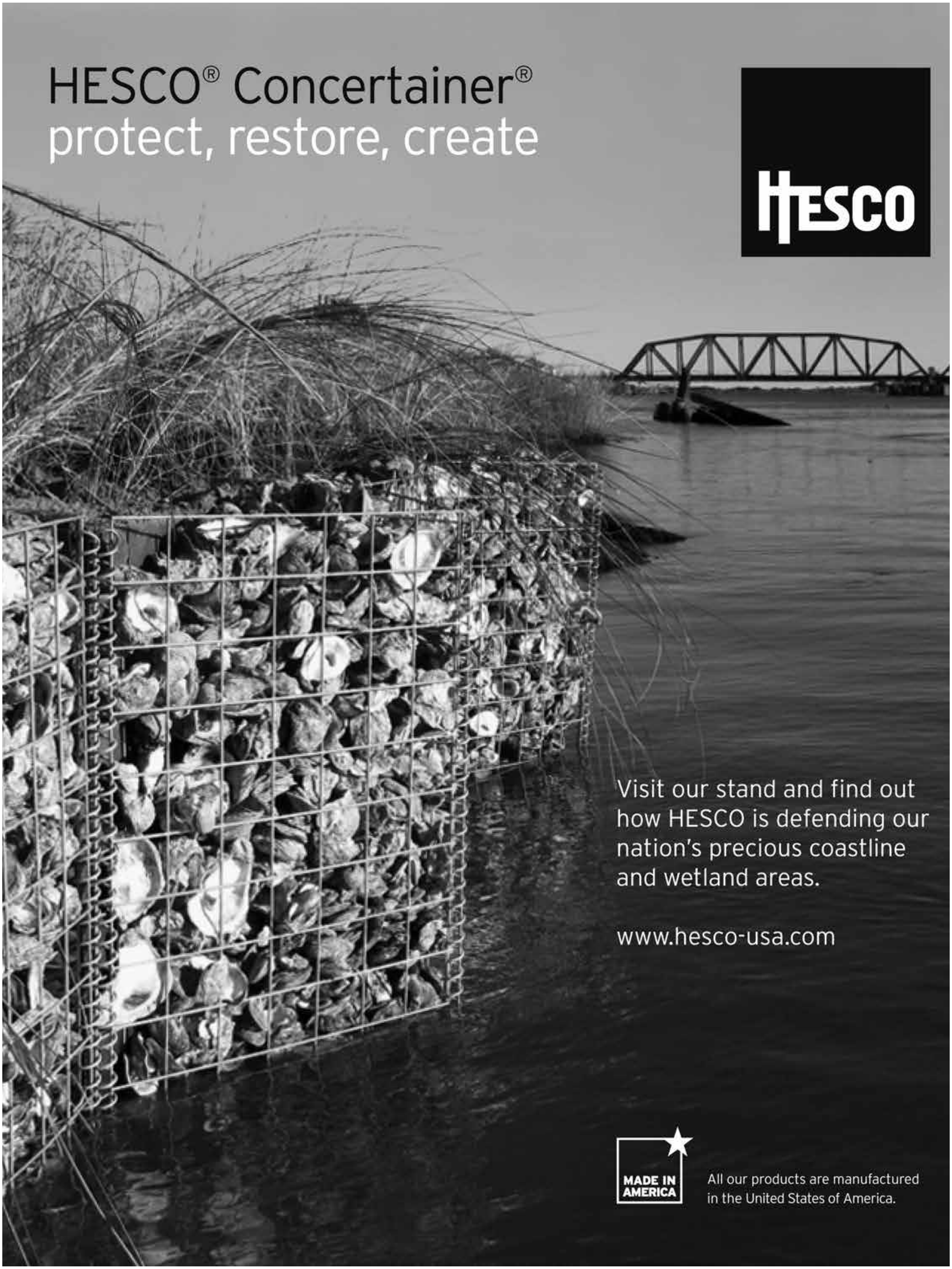
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Concurrent Session IV

Tuesday, June 26 8:30-10:00

Ecosystem Services (Room 257)

Moderator: Carol Parsons Richards
CPRA

Trajectory Economics: Dynamic Assessment of Ecosystem Service Flows from Coastal Land-Building Methods

***Rex H. Caffey*[1]*,* *Hua Wang*[1], *and Daniel Petrolia*[2]
[1] *Louisiana State University, Baton Rouge, LA 70803*
[2] *Mississippi State University*

Background
Coastal restoration in Louisiana is increasingly characterized by the use of rapid land building (RLB) techniques that rely on mechanical dredges and sediment conveyance pipelines for the purposes of marsh creation. To some extent, this aggressive approach to restoration is indicative of a growing recognition that time is a major limiting factor in addressing land loss in coastal Louisiana. Yet the advantages of RLB projects can be offset by their apparent high costs and low functionality when compared to more natural methods such as fresh water/sediment diversions (DIV). Such comparisons are central to a growing economic and ideological debate between advocates of these two methods, and one typically defined by a narrow interpretation of costs and benefits. Objective and comprehensive economic assessments are needed to help identify combinations of project types that provide the most efficient and sustainable provision of ecological services.

Objectives
The goal of this CREST-funded study was to develop a comparative economic assessment of RLB and DIV methods for coastal land-building. Specific objectives included: 1) estimating generic models of costs and benefits by technology; 2) conducting sensitivity analyses with varying degrees of risk; and, 3) performing case-studies to illustrate economic trade-offs between and within technologies.

Data and Methods
Data were collected for more than 146 authorized projects and project bids submitted to the Coastal Wetland Planning Protection and Restoration Act, the Coastal Impact Assistance Program, and the Louisiana Coastal Area Comprehensive Ecosystem Study. Projected acreage was used to construct generic restoration trajectories by technology and generic cost models were developed via regression analysis using technology-specific estimates for marsh creation projects (MC, n=69) and diversions (DIV_1, n=25). An exogenous model of diversion benefits (DIV_2) was utilized to capture a wider suite of nutrient and sediment contributions at specific flow rates. Generic models were incorporated into a net present valuation framework to examine the relative importance of specific project attributes. Average parameter values were used to establish baseline benefit-cost (B:C) projections. Sensitivity analysis was conducted by allowing a single, user-specified parameter to vary across its known range and solving for the break-even ecosystem service value ($/acre/year) in which the B:C ratio was equal to 1.0. Risk assessments were developed through an expected valuation construct incorporating data on hurricane landfall probability and measures of social risk.

Results
Comparative economic results are presented for 16 simulated projects in the upper and lower basins of Plaquemine Parish. As expected, unit costs are shown to decrease with increases in project time and scale, and increase at higher discount rates regardless of restoration method. Additional factors, such as mobilization and demobilization of dredging equipment, access dredging costs, and the distance between sediment borrow site and project site, served to significantly increase the unit costs of RLB projects. Through break-even analysis, MC project costs are found to exceed DIV_2 and DIV_1 costs at time periods of 25 and 35 years, pumping distances of 10 and 20 miles, and target scales of 4,000 and 10,000 acres, respectively. These intersection points increase substantially with the incorporation of method-specific and location-specific risks. The implications of these risks will be presented in detail, with specific recommendations for addressing limiting factors (physical and socioeconomic) by project type.

Implications
The majority of research in support of coastal restoration has historically derived from the biophysical sciences. Recent advancements in decision-support modeling; however, are allowing for a greater understanding of how the costs and benefits of restoration interact over temporal and spatial scales. While project selection processes have traditionally relied on limited interval or end-of-stage cost comparisons, economic modeling based on a dynamic trajectory allows for more comprehensive accounting of a project's ecosystem services over time. Through this approach, decision-makers can examine highly detailed economic trade-offs between project type, scale, time, distance, risk, and location. The model developed by this study provides a novel construct for examining the efficiency of competing projects, and it could substantially improve the return on investment from millions in state and federal dollars slated for coastal restoration in Louisiana.

Estimating the Capacity of Louisiana Coastal Marshes to Support Foraging Waterfowl During Winter

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Coastal Louisiana is a continentally important region for North American waterfowl, annually providing critical foraging habitat for >2.5 million wintering ducks and geese. Historical and ongoing loss of coastal marsh has potential to significantly reduce the capacity of this region to support wintering waterfowl. The Gulf Coast Joint Venture (GCJV) is a partnership of federal, state, and private conservation organizations dedicated to the conservation of habitats for priority bird species in the coastal portions of Alabama, Mississippi, Louisiana, and Texas. The GCJV promotes habitat conservation through a strategic and iterative process of biological planning, conservation design, habitat delivery, monitoring, and research to ensure efficient and effective use of limited conservation resources. Key components of this process are the identification of limiting factors and the use of species-habitat models to link population objectives to habitat delivery objectives. We present and discuss a conservation planning model for calculating the foraging needs of target waterfowl populations in Louisiana marshes and estimating the current capacity of Louisiana marshes to satisfy those needs. We compare current capacity to target foraging demands to assess whether extant landscapes are capable of satisfying habitat needs of target populations. Given appropriate data inputs, this model may also be used to forecast the capacity of future coastal landscapes to support wintering waterfowl, whether those landscapes are shaped by restoration activities, continued marsh loss, or sea level rise.

The availability of food-based energy is essential for timely completion of physiological and behavioral events experienced by waterfowl during winter, and the completion of these events may affect waterfowl survival and reproduction. The GCJV identified the availability of dietary energy, and therefore the availability of foraging habitat, as the factor encountered by waterfowl during winter having the greatest potential to limit population growth. We used a bioenergetics modeling approach combining published data and expert opinion on species-specific daily energy demands of waterfowl, species-specific habitat use of waterfowl, and habitat-specific food biomass to quantify dietary energy demands of target waterfowl populations. In a similar modeling framework, we used contemporary research and spatial data layers to estimate the waterfowl foraging capacity of Louisiana coastal marshes. Results from these analyses revealed significant deficits in coastal marsh foraging carrying capacity relative to levels needed to support GCJV waterfowl population objectives. Specifically, habitat deficits were 46% and 48% below objective levels for the Louisiana Chenier Plain and Mississippi River Deltaic Plain, respectively. Results from these efforts reinforce concerns about the consequences of coastal marsh loss to waterfowl wintering in coastal Louisiana.

Implications

When considered in the context of similar analyses for other waterfowl habitats, these results enable GCJV partners to effectively prioritize the expenditure of limited conservation resources. Additionally, this model may be used to assess the waterfowl foraging capacity of future scenarios of the Louisiana coastal landscape, thereby enabling objective quantification of the waterfowl benefits of alternative restoration scenarios. Likewise, application of this model to sea-level rise scenarios will enable calculations of their potential impact to waterfowl foraging habitat and the future capacity of the Louisiana coastal landscape to support wintering waterfowl.

Function and Diversity of the Ship, Trinity, and Tiger Shoal Complex, with Emphasis on Macroinfauna and Spawning Blue Crabs, Callinectes Sapidus

Gelpi, G. Carey Jr.*[1]*, *Richard Condrey[1], John Fleeger[2], Stanislas Dubois[3], Brian Fry[1]*

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[3] Laboratoire DYNECO / Ecologie Benthique, French Research Institute for Exploitation of the Sea, (IFREMER), Brest FRANCE

The ecological and economic value of sandy shoals off the Louisiana coast is not well understood. During three years of comprehensive benthic and environmental sampling we studied the Ship, Trinity, Tiger Shoal Complex (STTSC), which comprises changing and discrete benthic

habitats including high relief sandy shoals, and muddier, often deeper off shoal areas, prone to hypoxia. We found that benthic macrofaunal assemblages of shoals included endemic species, and were significantly different from each other and the muddier offshoal habitat, contributing to northern Gulf of Mexico regional biodiversity. Analysis determined sand percentage was the most influential environmental parameter shaping macrofaunal community composition across the region. Our study revealed several more potential shoal-based functions such as providing a conduit for Gulf of Mexico sandy-habitat metapopulations, serving as an oxygenated refuge from seasonal bottom water hypoxia, and functioning as offshore blue crab spawning grounds. We discovered unexpectedly high concentrations of spawning female blue crabs, greatly expanding what was previously understood about blue crab reproductive migrations. Blue crab abundances were significantly higher on Ship and Trinity Shoals than the surrounding muddy and deeper seafloor. STTSC blue crabs compared favorably with those from nationally recognized spawning grounds in terms of condition factor (an index of health), abundance, and fecundity. This work is the first to use an ecological field study to predict the number of days (~21) between successive spawns for blue crabs, suggesting that at least seven broods were produced per spawning season (~April– October). In addition, we used natural abundance isotopes ($\delta^{13}C$, $\delta^{15}N$) to link blue crabs from the STTSC to the inshore blue crab fishery. Using crab tissues (muscle and ovary) we analyzed isotopic variations related to salinity, and proximity to the Atchafalaya River indicating that crabs predominately migrate directly offshore from their home estuary, including low salinity environments. Isotopic analysis also suggests that crabs are utilizing offshore prey resources and do not re-enter inshore estuaries during the spawning season but rather remain offshore, continually spawning and hatching their eggs.

Implications

Ship Trinity and Tiger Shoals are being considered for sand mining to be used during various coastal restoration projects. However, this study has provided evidence that shoals are important contributors to the benthic ecology and system integrity of the Louisiana continental shelf. We have found evidence suggesting Ship, Trinity, and Tiger Shoals are integral components of several ecosystem functions and that further study is needed to better understand the details of their local and regional importance. These findings and analyses indicate that sand mining will diminish many potentially important shoal-based ecological services to the northern Gulf of Mexico. Potential losses to the ecology of the Louisiana continental shelf should be carefully weighed against projected benefits that may occur from planned coastal restoration efforts that will take sand from Ship, Trinity, or Tiger Shoals.

2012 Louisiana Coastal Master Plan: Physical Processes and Impacts (Room 255)

Moderator: Denise Reed
The Water Institute of the Gulf

Eco-Hydrology Modeling in Coastal Louisiana to Assess Project Effects on the Landscape

***Ehab Meselhe*[1]*,* *John A. McCorquodale[2], Jeff Shelden[3], Mark Dortch[3], Stokka Brown[4], Mallory Davis[4], Zhanxian Wang [3], Peter Elkan[3], and Jennifer Schindler[2]*
[1] The Water Institute of the Gulf
[2] University of New Orleans
[3] Moffatt and Nichol
[4] C.H. Fenstermaker & Associates

The future of the Louisiana Coast is uncertain due to the combination of natural and engineered alterations that have occurred over time. As such, it is imperative to develop tools to better understand how these changes affect the coastal system. These tools will be used to assess proposed measures to mitigate or eliminate adverse changes in an attempt to restore and protect the coast. A computationally efficient numerical tool has been developed to accomplish this goal. This numerical tool is a mass-balance compartment model that can be used to perform long-term eco-hydrology analyses of the Louisiana Coast.

The model consists of three sub-basin modules: Lake Pontchartrain/ Barataria Basin (PB), Atchafalaya Basin (AA), and Chenier Plain (CP). The PB model was previously developed in FORTRAN and has been used as the basis for developing the AA and CP models in the Berkeley Madonna modeling environment. The models are designed to calculate hydrodynamic and water quality processes over a 25-year period. They take into account water and constituents entering and exiting the domain, as well as the exchange between the compartments and the atmosphere. In addition to the hydrodynamics (stage, flow rate, and velocities), the following water quality constituents are included in the model: total suspended solids, salinity, total Kjeldahl nitrogen, water temperature, nitrate + nitrite nitrogen, ammonium nitrogen, dissolved organic nitrogen, total phosphorus, soluble phosphorus, phytoplankton as chlorophyll-a, detritus, water age, nitrogen removed, and accretion. All regions are calibrated and validated to observed data.

Proposed restoration and protection projects included in the models are marsh creation, hydrologic restoration, shoreline protection, ridge restoration, diversions, channel re-alignments, oyster reef developments, and hurricane protection projects. Simulations of these projects are performed to provide input values for other expert eco-system process models with a final goal of producing a comprehensive 50-year output that can be used to assess the effects of each proposed project as compared to a 50-year output where no projects are introduced.

Implications

This model was used to evaluate changes in the coast in support of the 2012 Coastal Master Plan. This is a broad, planning level model that when connected with the suite of other models used in this effort supports systems-level planning modeling for coastal Louisiana. This suite of models builds upon previous coastal planning models (e.g., LCA 2004 and CLEAR 2007). The models developed for the 2012 Coastal Master Plan form a robust suite of tools that can be used for future coastal planning efforts.

Storm Surge and Wave Modeling to Evaluate Coastal Restoration and Protection Projects for the 2012 Coastal Master Plan

***Hugh J. Roberts*[1]*, Zach Cobell[1], Jordan Fischbach[2], Joseph Suhayda[3]*
[1] ARCADIS, 4999 Pearl East Circle, Boulder, CO 80301
[2] RAND Corporation, Pittsburgh, PN
[3] Consulting Coastal Oceanographer

This work is being carried out by ARCADIS on behalf of the Coastal Protection and Restoration Authority (CPRA) of Louisiana. The study evaluates the surge and wave reduction potential of coastal restoration and protection projects. An environmental, social and economic assessment of each project is ultimately utilized by CPRA to formulate a suite of potential projects for inclusion in Louisiana's 2012 Coastal Master Plan. The storm surge and wave protection analysis as a component of the larger risk and damage assessment is the focus of this abstract.
The first phase of this project centered on optimization of a coupled hydrodynamic and wave modeling system which would meet the time and accuracy constraints of a statewide planning study by CPRA. The Advanced Circulation (ADCIRC) model coupled with the Unstructured Simulating Waves Nearshore (UnSWAN) model was selected. An initial study served to quantify runtime and relative accuracy for several levels of model resolution in order to recommend an optimal model setup.
The modeling paradigm made use of the existing high-resolution SL18 ADCIRC model and strategically de-refined the SL18 mesh while maintaining critical hydraulic features. Over 80% of the computational nodes were removed from the SL18 mesh, while maintaining similar levels of accuracy when hindcasting Hurricane Gustav and Hurricane Ike.

The model was applied to investigate the impact on storm surge and waves during hurricane conditions for various coastal protection and restoration alternatives. In order to investigate current and future benefits of projects, the surge and wave models were loosely coupled with ecosystem hydrology, wetland morphology, barrier shoreline morphology and vegetation models. Outputs from these loosely coupled models were applied in the storm surge and wave models to account for future scenarios of subsidence, accretion, coastal morphology and wetland loss.

The ensemble of ADCIRC and UnSWAN simulation results for current and future landscapes were subsequently used to inform the projected 50 year, 100 year and 500 year return periods for the various project alternatives and the State of Louisiana to prioritize funding of coastal projects.

Implications

This model was used to evaluate changes in the coast in support of the 2012 Coastal Master Plan. This is a planning level model that when connected with the suite of other models used in this effort supports systems-level planning modeling for coastal Louisiana. This suite of models builds upon previous coastal planning models (e.g., LACPR). The models developed for the 2012 Coastal Master Plan form a robust suite of tools that can be used for future coastal planning efforts.

Application of the Coastal Louisiana Risk Assessment (CLARA) Model to Predict Project Performance

Jordan R. Fischbach*[1]*, David R. Johnson[2], David S. Ortiz[1]

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[2] Pardee Rand Graduate School, Santa Monica, CA

The State of Louisiana Coastal Protection and Restoration Authority (CPRA) recently finalized its 2012 Coastal Master Plan, which specifies a set of storm surge flood risk reduction projects to be implemented over the next fifty years to help protect coastal communities from the effects of catastrophic hurricanes. To support this effort, CPRA evaluated series of proposed projects to determine the extent to which each action reduces the economic damages from storm surge flooding. Proposed projects included flood protection infrastructure such as levees, floodwalls, and gates, as well as nonstructural mitigation approaches such as floodproofing of buildings, home elevations, and structure acquisitions or relocations.

Complicating these comparisons, however, was substantial uncertainty about future flood risk in the region from a variety of different drivers, including coastal subsidence and land loss, population shifts, and climate change effects. We developed the Coastal Louisiana Risk Assessment Model (CLARA) to address the challenges posed by uncertainty and support the selection of effective risk reduction projects. CLARA is designed to specifically evaluate future flood risk under a wide range of uncertain scenarios about sea level rise, subsidence, and land loss; potential non-stationarity in future hurricane characteristics; future population growth; and the reliability of hurricane protection systems or other risk reduction tools.

CLARA includes innovative methods for calculating flood recurrence statistics and estimating flood depths interior to hurricane protection systems. These provide computational efficiencies to allow us to evaluate many scenarios within feasible limits on computing resources. In addition, the model considers the fragility of hurricane protection systems by estimating the probability of multiple modes of failure and incorporating these into overall risk estimates using Monte Carlo simulation. Flood damages are estimated using an inventory of coastal assets updated with 2010 Census data. Flood depths and economic risk are reported as 50-, 100-, and 500-year exceedance values and in terms of expected annual damage (EAD). We discuss these new methodologies and present key insights from the comparative analysis of projects for the master plan.

Implications

This model was used to evaluate changes in the coast in support of the 2012 Coastal Master Plan. This is a broad, planning level model that when connected with the suite of other models used in this effort supports systems-level planning modeling for coastal Louisiana. This suite of models builds upon previous coastal planning models (e.g., IPET 2009 and LACPR 2009). The models developed for the 2012 Coastal Master Plan form a robust suite of tools that can be used for future coastal planning efforts.

Sediment Transport (Room 253)

Moderator: Alex Kolker
Louisiana Universities Marine Consortium

West Bay Case Study: A Coastal Restoration Success with Policy Implications for Implementation of Future Land-Building Sediment Diversions

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[3] National Audubon Society

The Mississippi River Sediment Diversion at West Bay was authorized in 1991 by CWPPRA with the goal of building 9,831 acres of land over 20 years. Being the first project of its kind, it underwent and arduous planning and engineering process in order to encompass all stakeholder input. The diversion was constructed in November 2003 and designed to deliver an initial flow of 20,000 cfs at 50% river stage. With a diverted flow of this magnitude, induced shoaling upstream and downstream of the diversion was anticipated in the federally maintained Pilottown Anchorage Area and dredging funds were accounted for in the project budget.

Performance observations by LSU at West Bay included studies of sediment flux, deposition patterns, and retention rates through analyses of sediment cores, hydrodynamics, and pre and post construction bathymetry. Major findings (Andrus & Bentley, 2007) included an estimated sediment trapping efficiency at 25 – 50%, preliminary formation of a primary sub-deltadistributary channel, substantial erosion caused by Hurricane Katrina, and confirmation of an typical sub-delta growth curve of 100 – 150 years.

Results from continued analyses (Kemp, 2011) confirmed further deltaic evolution. In total 6.23 million cubic yards (mcy) of accretion was documented between 2009 and 2011. Of this, 2.92 mcy was beneficially used dredge material from the anchorage area, approximately half of which was used to create Sediment Retention Enhancement Devices (SREDs) in 2010. Deltaic sands and muds accounted for 3.65 mcy of this material which displayed classic pro-delta patterns including sub-aqueous distributary mouth bars, natural levees and trenasses, and newly formed sub-aerial deltaic islands. Contributing factors to this accelerated performance include reduced wave energy and re-suspension due to the SREDs, primary conveyance channel deepening and angle evolution, and optimal sediment loading conditions during the 2011 spring flood.

Despite a recent study (ERDC, 2009) which indicated that the diversion is only a minor contributing factor in the anchorage area sedimentation, the USACE, CWPPRA Task Force and State of Louisiana have decided not to continue paying for additional Mississippi River dredging expenses. Hence there are plans to close the diversion in mid-2013 only 10 years after opening.

Implications

Land-building sediment diversions have been included as a major component of the 2012 Draft Louisiana Master Plan for a Sustainable Coast. It includes 4 major diversions (>50,000 cfs) at an estimated cost of $1.6B to be implemented over the next 18 years. In many ways the West Bay diversion, still in its infancy, can be viewed as a coastal restoration success. It has shown engineers, scientists, and planners that the deltaic process can be recreated and even enhanced by beneficial use of dredged material and introduction of sediment-retention measures. The project has also served as a prime example of complex navigation issues which will inevitably surround every diversion project. There will even be engineering lessons learned in closing the diversion which can be used again at the end of each sub-delta life cycle. Ultimately, the scale of problem solving must propagate proportionally with the goals that have been set forth.

Sediment Flux and Fate to Lake Pontchartrain from the Bonnet Carré Spillway in the 2011 Mississississippi Flood

Samuel J Bentley*[1,3]*, *Jeffrey Fabre[1], Chunyan Li[2,3], Emily Smith[2], Nan Walker[2,3], John White[2], Lawrence Rouse[2,3], Sibel Bargu[2]*

[1] *Department of Geology and Geophysics, Louisiana State University, Baton Rouge LA*

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[3] *Coastal Studies Institute, Louisiana State University, Baton Rouge, LA*

Project Overview. From early May to late June 2011, enormous fluxes of water and sediment were delivered to Lake Pontchartrain by the Bonnet Carré Spillway from the Mississippi River, when river stages approached and locally exceeded records set by the Great Flood of 1927. Although nutrients associated with past spillway openings have been studied previously, sediment flux to Lake Pontchartrain from the spillway has never received extensive study. In light of the importance of Mississippi river-sediment budgets and anticipated developments of large river diversions for beneficial sediment delivery to the Mississippi Lower Delta Plain, we undertook a study of sediment flux, dispersal, and deposition. Sediment cores collected before and at the end of spillway operations have been examined using ^{210}Pb and ^{7}Be geochronology, X-radiography, and granulometry, in order to identify newly deposited sediment both visually and geochemically. MODIS satellite imagery was used to monitor plume dispersal. Time-series ADCP surveys and water samples documented water and sediment flux from the spillway into the lake. These methods are most effective in tracking the fate of fine sediments (silt and clay), in contrast to sand that is largely retained in the spillway and very close to the spillway outlet.

Results show that water and sediment discharge reached sustained rates of 8900 m^3s^{-1} and 77,000 metric tons d^{-1} respectively, and was rapidly dispersed across >70% of the lake within ten days of spillway opening. Fine sediment deposition in the lake rapidly increased near the spillway entrance in the first week of operation. Sediment core measurements completed following the July 7 sampling event (17 days after spillway closure) documented measureable sediment deposition in the lake as far as 40 km east and northeast of the spillway entrance, for a total estimated fine sediment deposition in the lake of 1.1-3.8 million metric tons. This range compares favorably with the total fine sediment flux measured within the spillway of 2.2 million metric tons, based on USGS measurements. This suggests that most of the fine sediment delivered by spillway operation was deposited within the lake within a matter of weeks.

Implications

To our knowledge, this is one of only two large-scale diversions (the other being West Bay, studied by Andrus and Bentley and later Kolker, using the same methods) that have been studied in terms of fine sediment fate during diversion operation at high river stage. For the present study, the relatively close correspondence between measured flux and measured deposition suggests that sediment retention rates (fraction of diversion sediment flux deposited on the seabed) approached 100%, much higher than the 25-50% estimated for West Bay, and also Wax Lake in other studies. One difference between Pontchartrain and these two other settings is the limited water exchange between Pontchartrain and open ocean, compared to the open seaward boundaries of West Bay and Atchafalaya Bay. This suggests that planning of diversion location should also take into account limiting seaward boundaries over which water and sediment exchange occurs, to maximize sediment retention.

The Influence of Cold-Front Passages in Sediment Dispersal During Floods: Wax Lake Delta and Surrounding Marshlands

***Harry H. Roberts[1]**, Ron DeLaune[2], Chunyan Li[1], DeWitt Braud[1], Charles Sasser[2], Zahid Muhammad[3], Syed M. Khalil[3]*

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Over 50% of suspended sediment available to the lower Mississippi and Atchafalaya Rivers is now delivered to the coast through the Wax Lake and Lower Atchafalaya River Outlets. Approximately 42% of this suspended sediment is currently transported through the Wax Lake Outlet. Since the building of the Wax Lake Outlet in 1941, the net result in Atchafalaya Bay of sediment transport by this route has been the building of the Wax Lake Delta which is frequently used as a predictor of land-building by river diversions. Although sand-rich substrates in a deltaic landscape are important to initiating marsh growth, finer-grained sediments are the norm for maintaining healthy marshlands by substrate accretion and nutrient delivery. In Atchafalaya Bay, the Wax Lake and Atchafalaya deltas are composed primarily of sand, but the fate of the finer fraction of the suspended load is only qualitatively known. The majority of the fine fraction is transported offshore to build a seaward prograding wedge of prodelta muds. Both delta growth and offshore mud accretion are linked to the annual flood cycle. However, short term water level set-up and set-down driven by cold front passages during floods modulates both offshore and onshore transport of suspended sediments. A more quantitative understanding of sediment transport in the Wax Lake Delta and adjacent coastal plain marshlands related to flood/cold front-driven processes seems critical to predicting the responses of river diversions and where to place them to obtain the maximum benefit of land-building as well as maintenance of surrounding marshlands.

Cross-channel Acoustic Doppler Current Profiler (ADCP) data verify that marshland tidal channels respond to pre-frontal water level set-up in Atchafalaya Bay by elevating water levels in channels and forcing overbank flow into surrounding marshlands. Short cores through feldspar plots and Be7 profiles confirm the collective importance of this process which promotes sediment accretion in both the delta and coastal marshland over a flood cycle. Vibracores confirm the long-term importance of flood/cold front processes. Instrumented tripods placed in a delta channel and in a coastal marshland channel confirm the dynamic conditions that result in suspended sediment transport associated with individual cold front passages and the river floods.

This study complements the ongoing "Atchafalaya Sediment Management Plan" which would help understand the sediment dynamics along with delineation of depocenters as well as land loss hotspots. The ultimate aim of the plan is to optimize sediment deposition in areas where sediment is needed, increase habitat continuity, and manage deltaic growth processes. The main objective is to recommend sediment management strategies that maximize the delivery of sediment to the coast integrating with the overarching Louisiana Sediment Management Plan (LASMP). All of these various studies together will provide much needed insight into management of Lower Mississippi River for a sustainable coastal restoration of Louisiana.

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Implications

If river diversions are initiated in locations so as to take advantage of the inland-directed suspended sediment transport process associated with the passage of cold fronts during river floods, surrounding wetlands will benefit from enhanced mineral sediment input and sediment retention in the system will be maximized.

Communicating Restoration Science (Room 252)

Moderator: Elizabeth "Boo" Thomas, Center for Planning Excellence

SciTEK: Blending Environmental Science with Traditional Ecological Knowledge

***Mathew Bethel* [1]*, Corey Miller*[2]*, Michelle Gremillion*[2]**

[1] Pontchartrain Institute for Environmental Studies

[2] UNO-CHART

The use of socio-ecological information gathered from indigenous peoples has been advocated by some of the world's premier social and physical scientists for years. In doing, so complex, changing ecological systems, such as the Gulf Coast Region, may become more socially, economically, and environmentally resilient. Additionally, local knowledge informs physical scientific analyses by providing a context upon which scientists can base their findings.

This interdisciplinary project is lead by Mathew Bethel, a staff member of UNO-PIES (Pontchartrain Institute for Environmental Studies), with UNO-CHART as co-P.I. Other partners include LA DNR and the Stennis Space Center. This project is investigating the feasibility and benefit of integrating geospatial technology with Traditional Ecological Knowledge (TEK) of an indigenous LA coastal population to assess the impacts of current and historical ecosystem change to community viability, i.e. considerations of risk. Simply put, the SciTEK project blends knowledge of local fishermen with environmental science data.

The primary goal is to provide resource managers with an accurate, cost-effective, and comprehensive method of assessing ecological change in the Gulf Coast region that can benefit community sustainability. A secondary goal is to refine a method that incorporates local knowledge into the coastal restoration decision-making process.

Using Remote Sensing (RS), Geographic Information Systems (GIS), and other geospatial technologies integrated with a coastal community's TEK to achieve this goal, our objectives are to determine (1) a method for producing a vulnerability/sustainability index for an ecosystem-dependent livelihood base of a coastal population that results from physical information derived from RS imagery and supported by TEK, and (2) to demonstrate how such an approach can engage both affected community residents and others who are interested in healthy marshes to understand better marsh health and ways that marsh health can be recognized, and the cause of declining marsh determined and improved.

This collaboration included commercial fisherman within the Barataria Basin, university researchers, and state and federal engineers and scientists. The fishermen providing the TEK were those who were most referred by coastal community members including shrimpers, oyster fishermen, crabbers, charter captains, and an array of other professional and recreational resource users. The SciTEK project utilizes a cutting-edge technological approach. In summary, the TEK is gathered through audio recordings via chartered boat trips and then coded into a format that is compatible with Geographic Information Systems. The resulting product is integrated maps which blend satellite imagery, field data sampling, and TEK.

Implications

The SciTEK project directly impacts the vision of coastal protection planning as it provides a link between information gathered by coastal scientists and local citizens who live on the land. This methodology improves the process for incorporating local knowledge into coastal restoration decision-making. It seeks out respected community members whose knowledge may be otherwise omitted. It utilizes observational knowledge that comes from living and working in the environment. This includes vast amounts of first-hand and generational knowledge of coastal processes, changes, and experiences regarding the effectiveness of restoration efforts. This could result in the better use of money when planning, implementing, and managing restoration. Most importantly, it provides an avenue of effective collaboration with coastal communities.

The Evolution of Public Outreach in Wetland Restoration Ecosystems

Scott Wilson[1], ***Susan Testroet-Bergeron***[2], *Cole Ruckstuhl*[2]
[1] *CWPPRA Public Outreach Committee Chairman, U.S.G.S. NWRC, 700 Cajundome Blvd., Lafayette, LA 70506 USA*
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Join these animated speakers as they hustle through the progression of public instruction and engagement used to explain wetland restoration in Louisiana's dynamic ecosystem. Learning to involve the public in understanding the unique and vital ecological assets of wetlands is a secret very few ecosystem management teams have learned. The Coastal Wetlands Planning, Protection and Restoration Act Public Outreach Committee has been successful in engaging a wide variety of audiences with its multi-tiered approach that has evolved as technology and techniques change.

In Louisiana, the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Task Force currently has 148 active restoration projects in development with 93 of those projects having completed the engineering, design, and construction phases. Each of these projects begins and expands through an organized public participation process and is developed with a variety of stakeholders including federal, state, and local governments along with business and industry partners. Over its twenty years history of restoration activities, CWPPRA has used a wide diversity of techniques to engage the public in Louisiana's land loss issues and its urgent need for rebuilding a fragile estuarine ecosystem.

CWPPRA's productive public engagement activities include a mixture of techniques that are active practices which prepare the public to engage on a multitude of levels. In addition to its organized public meeting forum, CWPPRA provides the public with access to host of information via its Web site www.LACoast.gov. With approximately one million hits per month, the CWPPRA site includes copies of the defining legislation, detailed standard operating procedures (SOPs), a fact sheet for each project, related wetland maps, educational materials, monitoring data, scientific reports, animations, videos, interactive classRoom 257ctivities, slide shows, access to information on volunteering, and legislative delegate information.

With less than 1% of the annual budget, the CWPPRA Public Outreach Committee has also created take-away publications that include a glossy bi-annual magazine titled WaterMarks, a variety of educational CDs for teachers of students in grades K-12, posters, and a public speaking venue that includes universities, businesses, and educators. Additionally, CWPPRA publishes a "CWPPRA Newsflash" that includes current Louisiana wetlands topics and upcoming meetings as well as the Louisiana Unified Coastal Community (LUCC or Lucy) Calendar.
The outreach team is now meeting needs using Facebook and YouTube to engage younger audiences without abandoning effective albeit traditional ways to communicate with the public. Providing the public with appropriate access to information and logical, timely ways to become involved are key to promoting ecosystem restoration activities. Contact Information: Scott Wilson, Susan Testroet-Bergeron, or Cole Ruckstuhl at the U.S. Geological Survey, National Wetlands Research Center, 700 Cajundome Blvd. Lafayette, LA 70506, USA, Phone: 337-266-8623, Cell: 337-501-2333, Fax: 337-266-8513, Emails: Scott_Wilson@usgs.gov, BergeronS@usgs.gov, RuckstuhlC@usgs.gov.

Implications

Implementation of coastal restoration in a state where 80% of the coastal community is held by private landowners is dependent on public engagement and involvement. The future of coastal restoration in Louisiana is reliant on community backing. The people of Louisiana know they are living on a "sinking" platform. The questions the general public always have include: what restoration has been done, what funds are available for future work, and how will funds be effectively used. CWPPRA is a model of how people can be engaged with the scientific ecosystem recovery of an area. This captivating look at restoration outreach and education light-heartedly pokes fun at CWPPRA's shortcomings and true success stories while bridging the "spot on" need to continue to help educate citizens so that voters can make informed choices and decisions.

Designing Institutions and Programs for Large Scale Ecosystem Restoration: Lessons Learned from the Great Lakes Experience

Michael J. Donahue, Ph.D.[1]
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Recent decades have witnessed the "re-discovery" of watershed-based approaches to resource planning and management. Accompanying this has been a nation-wide trend toward large scale programs for coastal and ecosystem restoration, ranging from Chesapeake Bay to Puget Sound, from Coastal Louisiana to the Great Lakes, and all points between. This trend is expected to continue, as evidenced by a sustained commitment at the federal agency and Congressional levels, backed by a continuing series of Presidential Executive Orders and initiatives focused on specific coastal areas and major lake and river basins.

This "re-discovery" has been accompanied by a renewed interest in the types of multi-jurisdictional institutions needed to transcend geo-political boundaries and focus laws, policies, programs and restoration projects on a hydrologic basis. Additionally, policy-makers and resource managers are seeking out models and strategies for the design and application of programs in light of the unique challenges posed by large scale coastal and ecosystem restoration efforts. Such challenges include the expansiveness of the area of focus; its physical, chemical and biological components and complex interactions; multiple and often conflicting uses; socio-economic and cultural considerations; and a complex array of public and non-governmental organizations, each with its own set of authorities, interests, capabilities and visions for the resource. Despite these challenges, however, the commitment to large scale restoration programs remains strong, as does the fundamental commitment to watershed-based solutions to watershed problems.

This presentation provides practical and "time-tested" guidance in the design and implementation of large scale coastal and ecosystem restoration programs and the institutions charged with their implementation. The culmination of multiple "applied research" projects (as well as the author's own experience as a practitioner), it is based upon an extensive historical analysis of the evolution of the "watershed approach" to Basin governance; a review of the formation, evolution and current status of multiple large scale coastal and ecosystem restoration programs in the U.S. and Canada; and a determination of critical structural and operational characteristics for Basin institutions, informed by survey and interview-generated outcomes.

A particular emphasis is placed on transferable "lessons learned" from the Great Lakes as they relate to 1) the evolution, current status and prospects for current ecosystem restoration efforts; and 2) the types of institutions (and associated characteristics) best suited to manage large scale restoration initiatives. Great Lakes ecosystem restoration- and Basin governance in particular- has been evolving for literally more than a century and Basin jurisdictions have experimented with multiple forms of multi-jurisdictional governance.

While the attributes, restoration needs and management requirements are unique from one coastal/ ecosystem setting to the next, there are a series of “best practices” and “lessons learned” that transcend that uniqueness. *As such, the outcome of this presentation is a “checklist” of practical advice in the development, refinement and execution of large scale coastal and ecosystem restoration programs, as well as in the design and operation of the selected management institution.*

Implications

In many respects, the design and management of large scale restoration programs can be as complex and challenging as the science and engineering invested in problem resolution. And, significantly, governance arrangements for ecosystem restoration- if improperly designed and executed- can compromise the success of even the most technically sound and innovative restoration program. This presentation is the culmination of applied research and practical experience drawn from large scale coastal and ecosystem restoration efforts in multiple locations throughout the U.S. and Canada, with an emphasis on the Great Lakes experience (and experiment) in ecosystem restoration. *Many “lessons learned” from all such initiatives have universal application in the design and implementation of restoration programs and the institutions selected (or established) to manage them. Thus, the presentation will be of interest and relevance for all large scale coastal and ecosystem restoration initiatives- either underway or planned.*

Concurrent Session V

Tuesday, June 26 10:30-12:00

Coastal Protection (Room 257)

Moderator: Billy Wall
CPRA

Identifying Strategies to Reduce Flood Risk in New Orleans that are More Robust to Future Uncertainty

Jordan R. Fischbach[1], *David G. Groves[2], David R. Johnson[3], Henry H. Willis[1], Amy Lesen[4], Mark S. Davis[5], Earthea A. Nance[6]*

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Recent upgrades to New Orleans’ flood risk reduction system, designed to protect against the 100-year flooding event (those that have a 1% annual chance of occurring), have improved the city’s resilience to future flooding. After Hurricane Katrina, however, many have argued that a 100-year protection standard is insufficient for a densely populated and economically important city such as New Orleans. Furthermore, future flood risk may be increasing due to ongoing coastal land loss associated with land subsidence and rising sea levels, as well as population growth and shifting demographic patterns. These factors are not fully accounted for in the 100-year design of the levee system, and uncertainty about them makes it difficult to estimate how flood risk could increase in the future.

This presentation addresses one of New Orleans’ most critical challenges: how to make the city more resilient to flood damages when future risk cannot be accurately predicted. Rather than focus on additional structural infrastructure investments, this analysis evaluates “nonstructural” risk mitigation options applied at the neighborhood level across New Orleans. Nonstructural risk mitigation includes incentives for elevating or floodproofing existing or new structures, incentives for relocation to lower risk areas, and land use restrictions designed to curtail future growth in the floodplain.

Using funding from the NOAA-SARP program, we developed a low-resolution model of flood risk in New Orleans that estimates property risk annually from 2012 through 2061 across a wide range of futures reflecting uncertainty. The model evaluates flood risk with and without different nonstructural risk mitigation programs in place. A version of this model was also used as a basis for the risk reduction project comparison performed for Louisiana’s 2012 Coastal Master Plan, and incorporates new storm surge simulations performed for the master plan effort. Using this output, we applied exploratory modeling and Robust Decision Making (RDM) methods to a) identify nonstructural risk mitigation strategies that balance risk reduction and implementation costs across many of the plausible futures, and b) identify scenarios in which current alternatives yield negative net economic benefits or excessive levels of residual risk.

Implications

The 2012 Coastal Master Plan suggests that Louisiana should invest approximately $10 billion in nonstructural risk mitigation programs across the state through 2061. This study considers the value of nonstructural investments behind the levees in New Orleans to both augment the current level of risk reduction and help provide a hedge against worsening risk over time, and suggests which areas of the city should be the focus of new nonstructural investments.

"The Ground is Moving - The Use of Wick Drains and Staged Construction in LPV 109.02a Levee Construction over Very Soft Soils"

John Volk[1], *Dwayne Smith[1], Thandav Murthy[1], Peter Cali[2], James Evans[2], John Monroe[2], Ariel Buenano[1], Carter Bagley[2]*

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LPV 109.02a is a 7.5 mile reach in New Orleans East. The existing levees (NE-10 and NE-11A) will be raised approximately 4 to 7 feet with a protected side raise on virgin ground. The new levee construction requires embankment construction in two stages to heights of 18 to 22 feet above existing grades of the tidal marsh. The raise will be accomplished with the use of stability berms, wick drains and high-strength geotextiles. The use of these techniques allows the levee to be constructed, and put into service in an expedited way. These techniques greatly reduce the time of settlement from years to months, allowing for construction of higher fills because of the soil's rapid strength increase. As part of this construction are four drainage structures and two pump stations that will be supported on soil-cement mixing panels.

The subsurface conditions indicate soft clay deposits to depths of 30 to 40 feet below the ground surface. To allow for strength gain in the soft clay soils and to avoid a shear failure, the levee construction will be accomplished in two controlled rates of loading (construction stages) with approximately a two to three -month waiting period between Stage 1 design height and the construction of Stage 2. A stability berm 125 to 180 feet long to the protected side is also required to resist deep, rotational failures and thus reduce the number of construction stages to two. Wick drains (150 to 220 feet in width) will be installed at a five feet triangular spacing to a depth not closer than 6 feet from any pervious sand stratum. The wick drains shorten drainage paths for the pore water to exit the compressible clay soils and thus reduce the time for settlement and strength gain. A test section was designed and constructed to optimize the wick drain design and estimate time of consolidation for the staged construction. High-strength geotextile reinforcement will be installed to increase stability and meet appropriate FS. The new levees are estimated to settle up to six feet over a period of 10 years.

This presentation will describe the design methodology and challenges. These include: a SEEP/W finite-element seepage analysis in the design of the drainage blanket and wick drains; a fully instrumented test embankment with three wick drain spacings to optimize the wick drain design; the slope stability analyses with high-strength geotextiles; site characterization of soft clays with triaxial shear UU testing, cone-penetrometer testing (CPT's), and vane shear testing; and stability analyses of soil-cement mixing panels under drainage structures.

The use of the wick drains and staged construction resulted in a very cost-effective solution to raising levees over soft soils, while controlling schedule.

Implications

Improvements to the existing Flood Protections System are going to require levee raises on very soft and settlement sensitive soil conditions typical of Southern Louisiana. These levee raises will also be performed with ever shrinking budgets. The use of stage load construction, geosynthetics, and wick drains as described in this presentation is an effective method of achieving the additional protection needed, while controlling the cost and schedule of the project.

Coastal Structures & Sea Level Rise: An Adaptive Management Approach

John Headland,[1] *Jonathan Hird,[2]*

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Coastal protection projects should be planned in a way that accommodates projected sea level rise (SLR). In the absence of codified planning guidance, agencies are often at the center of the SLR debate and are forced to plan in an ad hoc manner. Presently, there is little planning guidance for developing coastal infrastructure projects that accommodate future SLR scenarios. One option is to require that projects are designed to a fixed rise in sea level. The approach could, for example, mandate that a coastal structure be designed/improved for an explicit vertical rise in Sea Level, such as a 50 year period. While this choice has some merits including simplicity, it does not allow for the wide range of projected SRL rise scenarios and presumes that the fixed rise will occur. It also has the potential to: (1) unnecessarily overbuild structures with attendant cost issues and (2) have greater (and potentially unnecessary) environmental impacts (e.g. larger footprint.).

Optimization analysis approach is often performed in order to develop coastal structure designs that balance initial and long-term maintenance costs. Designs for low return periods result in an inordinate amount maintenance costs. Likewise, designing for large return periods is not cost effective though it can minimize and/or eliminate maintenance costs. One of the shortcomings of SLR science is that little is known about the probabilities associated with the various SLR scenarios. This uncertainty suggests another approach, namely: adaptive management. The objective of the adaptive management approach is to heighten/strengthen the existing structure over time to meet SLR. The length and rise of the initial and subsequent periods depend on the SLR scenario, the higher the rise rate, the shorter the periods. The intent is to minimize the adaptive steps while keeping pace with SLR. The methodology consists of adapting the structure with elevation and/or other strength improvements over time.

While a plethora of projected SLR scenarios have been advanced, the challenge is to plan/design coastal protection projects for SLR. One approach is to select a target number (e.g., a medium SLR scenario 50 years hence) and design (or improve an existing design) ahead of time for this SLR. The other approach is to design for a shorter period (say 20 years) and adapt the design to accommodate SLR over time. For example, consider a structure that is initially designed for the existing SLR rate. After an initial period, observation of SLR will make it possible to determine how much the structure should be adapted to accommodate the SLR elevation at the end of that period. The next step is to evaluate the total cost of adaptive management and compare that costs to a scenario where the structure is built in year one to accommodate the full-period of SLR. The utility of this approach is quantified using net present value (NPV) analyses. NPV analysis for an example coastal dike shows there is little practical difference in the forecast range of SLR scenarios and the costs to mitigate the effects of those scenarios.

Implications

The coasts of the United States and the world are not equal; some will be more impacted by SLR than others and it is incumbent on coastal engineers and planners to develop thoughtful and economically viable solutions to cope with SLR. Adaptive management appears to be an expedient and cost conscious approach given the significant uncertainties in SLR forecasts. SLR and climate change may be a great challenge, but there will likely be tractable solutions in many cases.

2012 Louisiana Coastal Master Plan: Landscape Response (Room 255)

Moderator: Natalie Snider
CPRA

Spatial Modeling of Land Change and Relative Elevation to Assess Restoration Priorities in Coastal Louisiana

Brady R. Couvillion[1], *Gregory D. Steyer[1], Hongqing Wang[1], John Rybczyk[2], William Sleavin[1], Holly Beck[7], Guerry O. Holm, Jr.[3], Yvonne Allen[4], Craig J. Fischenich[5], Ronald G. Boustany[6]*

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Louisiana is experiencing the most critical coastal wetland erosion and land loss problems in the United States. Although there are many causes for this loss, reductions in freshwater and sediment inputs coupled with high subsidence rates are key factors. To develop priorities for restoration and protection efforts, Louisiana's 2012 Coastal Master Plan utilized a suite of models to assess landscape response under future conditions with and without further restoration and protection investments. The master plan effort developed a land change and relative elevation model that was used to predict changes in coast-wide wetland and water acreage, landscape configuration, vertical accretion and elevation under varying scenarios of accelerated sea level rise (SLR), subsidence and restoration projects from 2010-2060. The landscape change sub-model predicts wetland morphologic dynamics by incorporating decadal land change trends with probabilities of marsh collapse based on given changes in inundation depth and salinity regimes. The relative elevation sub-model calculates vertical accretion and organic matter accumulation from simulated mineral sedimentation rates and site-specific soil bulk density and organic matter data. Mineral sediment accumulation was derived from a coast-wide compartment-based hydrodynamic model and then spatially redistributed using a weight surface.

Bulk density and percent organic matter were calibrated among hydrologic basins and vegetation types using soil core data from Louisiana's Coastwide Reference Monitoring System (CRMS) and the Louisiana Coastal Area Science & Technology Program. Using an empirical relative elevation model, coast-wide changes in bathymetry and topography were assessed under natural and anthropogenic factors. Spatial modeling results indicated a substantial portion of the Mississippi River Delta wetlands, under "future without" project scenarios, would be submerged in the next half-century under high SLR and subsidence rates. The magnitude of wetland loss varies substantially by hydrologic basin and vegetation types and is dependent upon the rate of subsidence and other causal mechanisms. Model outputs suggest that significant restoration project investments such as marsh creation, shoreline protection, ridge restoration, and freshwater diversion projects are capable of maintaining soil elevation and reducing associated land loss rates. This presentation will provide an overview of the modeling effort including limitations and assumptions of the models and future steps for model improvements.

Implications

This model was used to evaluate changes in the coast in support of the 2012 Coastal Master Plan. This is a broad, planning level model that when connected with the suite of other models used in this effort supports systems-level planning modeling for coastal Louisiana. This suite of models builds upon previous coastal planning models (e.g., LCA 2004 and CLEAR 2007). The models developed for the 2012 Coastal Master Plan form a robust suite of tools that can be used for future coastal planning efforts.

Short-term Modeling of Coastal Response to Wave Climate and Relative Sea Level Rise

Ioannis Georgiou[1], Zoe Hughes[2], Dallon Weathers[1], Mark Kulp[1], Duncan FitzGerald[2]

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[2] Dept. of Earth Sciences, Boston University, Boston, MA

Louisiana coastlines have eroded at an alarming rate in response to tropical storms (Martinez et al., 2009; Howes et al., 2010), high rates of relative sea level rise (Zervas, 2009, i.e. NOAA Technical Report NOS CO-OPS 053) and extensive interior wetland loss (Barras et al., 2006; Couvillion et al., 2011) which has resulted in the enlargement of the tidal prism (Howes, 2009; FitzGerald et al., 2007). To aid the Coastal Protection and Restoration Authority (CPRA) of Louisiana in coastwide restoration planning efforts, we developed modeling tools to help predict the future morphology of coastlines throughout southeast Louisiana. This model focused on the barrier shorelines. We used a hybrid method incorporating a one-dimensional, cross-shore profile evolution model, coupled with a planform evolution of the coast wide shoreline. The model was driven with offshore wave climate, transformed through breaking near the shoreline. We used a longshore transport formula and a sediment continuity approach to determine local fluxes and resulting erosional and depositional trends. The planform resolution is approximately 100 m; cross-shore resolution is significantly higher. In addition to offshore wave climate, the model was driven by changes in relative sea-level rise. After calibration using historic shorelines of 1989 through 2009, we simulated the response of the barrier islands and adjacent shorelines response to different eustatic sea-level rise and subsidence scenarios, and a variety of restoration projects selected by the CPRA. Results show that erosion rates without restoration vary spatially and temporally throughout the coast, and are a function of relative seal-level rise. Erosion rates for the central coast approximate 3 m/y, whereas near headlands and the Mississippi river delta may be as much as 9 m/y. The predicted rates for more extreme sea-level rise scenarios reveal at least a 10-15 % increase of the erosion rate per annum, but more importantly, barrier erosion truncates the entire backbarrier platform. This takes place in 35–40 years under normal conditions, but is reduced to 25–30 years under more extreme rates of sea-level rise, suggesting that a new transport regime or threshold maybe present and that restoration is critical to maintaining sandy shorelines in the midst of relative sea-level rise.

Barrier islands restoration and resulting benefits have long been a topic of discussion, debate, and at times the center of controversy. The impact of large hurricanes in 2005 and the destructive forces that accompanied these storms, confirmed that we know little about the islands recover following the storm. Most importantly, how do barriers continue to respond to long-term forcing, such as relative sea-level rise, following a storm, and does restoration help barriers keep pace in the midst of relative sea-level rise. Our results show that without backbarrier and beach/dune restoration barriers will retreat beyond the line of marsh fringing the back of the island more rapidly, compared to simulations with restoration. This would impact the transport regime of the barrier and could have implications for future barrier response to or rate of recovery following storms, without a backbarrier platform to help accelerate recovery.

Implications

This model was used to evaluate changes in the barrier shorline in support of the 2012 Coastal Master Plan. This is a broad, planning level model that when connected with the suite of other models used in this effort supports systems-level planning modeling for coastal Louisiana. The suite of models builds upon previous coastal planning models (e.g., LCA 2004 and CLEAR 2007), but this model was newly developed for this effort. The models developed for the 2012 Coastal Master Plan form a robust suite of tools that can be used for future coastal planning efforts.

Forecasting Vegetation Changes in Coastal Louisiana with LaVegMod

Jenneke M. Visser*[1]*, *Scott Duke-Sylvester*[1]*, Jacoby Carter*[2]*, Whitney Broussard*[1]

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As part of the planning effort for coastal restoration and protection by the Coastal Protection and Restoration Authority of Louisiana, a vegetation model (LaVegMod) was developed to forecast vegetation changes resulting from restoration and protection actions for three future scenarios over a 50 year period. LaVegMod takes input on water-level and salinity forecasted by an eco-hydrology model as well as changes in the area of land and elevation forecasted by a morphology model. Based on these inputs and the environmental niche for each vegetation type, LaVegMod forecasts changes in vegetation composition over time. There is a feedback between these three models at 25 year intervals. Instead of the four salinity zone model used in previous planning efforts, LaVegMod uses 19 wetland vegetation classes that show the different height and habitat characteristics needed as inputs for subsequent models. In addition the model forecasts the presence of submerged aquatic vegetation (SAV) based on water depth, salinity and temperature during the summer months. The emergent vegetation model is informed by an analysis of the Coastwide Reference Monitoring System and the SAV model is informed by a previous survey of SAV presence and environmental data. Based on water level variability and salinity that occurred during a year, the model predicts a mortality percentage of the existing emergent vegetation types and the hydrology in the subsequent year determines which new vegetation type will establish. Changes in vegetation from the Future Without Action results under various future scenarios are compared with the draft and final master plans evaluated for Louisiana's 2012 Coastal Master Plan.

Implications

This model was used to evaluate changes in the coast in support of the 2012 Coastal Master Plan. This is a broad, planning level model that when connected with the suite of other models used in this effort supports systems-level planning modeling for coastal Louisiana. This suite of models builds upon previous coastal planning models (e.g., LCA 2004 and CLEAR 2007). The models developed for the 2012 Coastal Master Plan form a robust suite of tools that can be used for future coastal planning efforts. LAVegMod output was used by the storm surge model to incorporate a surface roughness parameter and by higher trophic level models to estimate the changes in ecosystem services derived from the coastal zone.

Atchafalaya and Wax Lake Basin and Deltas II (Room 253)

Moderator: Clint Willson
Louisiana State University

Sediment Deposition Patterns in a Prograding Delta as a Result of Mississippi/Atchafalaya River Spring Flood Discharge

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Currently coastal Louisiana is losing land at a rapid rate; however, there are some areas where land is being built as a result of riverine sediment delivery. Two such places are the Wax Lake and Atchafalaya sub-deltas. These deltas, located at the mouth of the Wax Lake outlet and the Lower Atchafalaya River, together receive 30% of the total flow of the combined Mississippi and Red Rivers. Previous studies have shown that both spring flooding and tropical storm events deliver sediments to this area, though the sediment subsidy as a result of annual spring flooding is greater relative to storm delivered sediments. We sought to quantify the relative sediment contribution from floods of different discharge and duration. In order to do this we measured sediment elevation along seven 100 to 140 m long transects located on intertidal freshwater wetlands both before and after the spring floods in 2008, 2009, 2010, and 2011. The transects were aligned along the natural elevation gradient of the delta islands and encompassed the full range of intertidal elevations that occur at Wax Lake sub-delta. During these years the largest (2011) and tenth largest (2008) flooding events on the Mississippi/Atchafalaya River system over the last 50 years occurred. Following each flood we estimated both sediment deposition and erosion along the transects, from this we calculated mean net deposition for each transect and across all seven transects. Total net deposition was greatest during the two largest flood years (2008 and 2011), and close to zero during the more average flooding events which occurred in 2009 and 2010. There was not significantly different mean net deposition in 2008 (5.40 cm) and 2011 (4.86 cm), despite the increased discharge that occurred in 2011. Our results indicate that during years in which the maximum discharge of Wax Lake outlet exceeds 6500 $m^3 s^{-1}$, land building is most likely to occur. It is possible that other factors may be important for capacity to build land in a given year, such as duration and timing of the peak or peaks, however these were not addressed in this study.

Implications

The results of this study help to refine our understanding of the role that large scale sediment diversions can play in rebuilding coastal Louisiana, as well as under what conditions their use is most advantageous for land building. Optimizing diversion usage to allow for the most benefit while minimizing the amount of discharge during lower flow years may be a way to find balance between the needs of various stakeholders in the restoration of coastal Louisiana.

Sedimentation and Vegetation Community Change in the Wax Lake Delta Following the 2011 Mississippi River Flood

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[4] *University of Louisiana, Lafayette, Louisiana,*

In May 2011, high rainfall in the upper Mississippi River basin combined with spring snowmelt to generate a record flood on the lower Mississippi River. Discharge to the lower river exceeded that of the catastrophic floods of 1927 and 1937, as well as the more recent flood of 1973. The lower river remained above flood stage for nearly 2 months – from early May to late June 2011. At peak flow, about 313,000 cfs of sediment-laden floodwaters was discharged through the Wax Lake outlet and into the Wax Lake Delta in Atchafalaya Bay, as measured by the U.S. Geological Survey gauging station at the Wax Lake Outlet at Calumet, Louisiana. We used a combination of high resolution WorldView-2 multispectral imagery and Landsat TM imagery to map vegetation community changes and relate those changes to sedimentation patterns within Wax Lake Delta as a result of the 2011 flood. We performed supervised maximum likelihood classifications on June 2010 and October 2011 WorldView-2 imagery and on October 2010, and July, August, and October 2011 Landsat 5 TM using reference data collected in the field in August and September 2011 and a reference map of vegetation communities in the delta ground-truthed in Summer 2010. We calculated the accuracy of the October 2011 WorldView-2 classification and August 2011 Landsat TM classification using a stratified random sample of 85 1-meter vegetation cover plots collected in the field in August and September 2011. Elevation distributions for each vegetation class were calculated by sampling a high resolution digital elevation model of the delta derived from LiDAR data. This allowed us to map areas of sediment deposition and erosion based on observed vegetation community changes following the flood event. The horizontal expansion of the vegetated surface of the delta was also measured by comparing October 2010 and October 2011 Landsat TM imagery. The results indicate a minimum of 12.4 km^2 of new land growth associated with the flood event. In addition, vegetation community changes suggest that elevation increased across 10.3 km^2, or 50 percent of the delta's low-elevation communities. These results highlight the importance of infrequent, large flood events to land-building processes within the Mississippi River delta.

Implications

The Wax Lake Delta is a naturally-evolving, progradational delta in coastal Louisiana and serves as a valuable reference system for estimating the impact that large-scale sediment and water diversions may have on offsetting land-loss in other parts of the Mississippi River deltaic plain. In addition, the landscape-scale monitoring method demonstrated by this project provides a cost-effective means of monitoring the progress of large-scale coastal restoration projects. Mapping vegetation community change over time, when combined with the known elevation ranges of specific species within the coastal setting, could assist managers in scaling up estimates of coastal sedimentation and vertical accretion. When combined with in-situ monitoring of elevation changes, this method could allow for more robust monitoring of elevation change over time across large coastal landscapes.

The Effect of Climate and River Discharge on Interannual Variation in Aboveground Biomass of Delta Splays

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[2] *University of Louisisana Lafayette*

Aboveground biomass plots (n = 938) were collected once annually at the end of the growing season from two Balize delta splays at three sites from 1984 to 2010. Samples were sorted to the two most abundant genera – *Schoenoplectus* (species *deltarum*) and *Sagittaria* (species *latifolia* and *platyphylla*) and into other taxa – which were then dried to constant weight. Over the same time period water quality data (discharge, temperature, nutrient loads) on the Mississippi River were obtained. The temperature records were used to find the Julian day on which the river exceeded 15°C until September 1. This day was subtracted from the Julian day from September 1 to estimate length of the growing season. To calculate monthly nutrient loading the average monthly concentration was multiplied with the average discharge. The growing season load was calculated as the sum of the average monthly loads from April through August. We applied quantile regression using total live biomass, as well as the biomass of *Schoenoplectus* and *Sagittaria* as the dependent variables, and average annual discharge, spring discharge, average annual nitrate concentration, nitrate load, TKN load, length of growing season, and average summer water temperature.

End of the growing season biomass averaged ~520 g/m^2 over the period 1988 to 2010 – the period post the early outlier years of mudflat colonization through stabilization. Over these 23 years the total biomass at the sites increased significantly linearly ~1.4%/yr. During the same period average river temperature showed a significant linear increase from 1983 to 2010 and as a result there is a significant increase in the length of the growing season. However, there are significant fluctuations around the trends. In contrast, quantile regression showed a significant decrease in total biomass with increasing growing season length. In years with longer growing seasons, *Sagittaria* increased and *Schoenoplectus* decreased. *Sagittaria* tended to have lower end-of-season biomass than the *Schoenoplectus* it replaces during those years. Therefore, the temporal trend of increased biomass maybe related to a combination of environmental changes over time. Quantile regression also identified that river discharge has a curvilinear effect with highest total biomass occurring in years with spring discharge averaging 700,000 cfs. Nitrogen concentrations in the river where not found to control aboveground biomass, but growing season (April - August) nitrate loading followed a similar pattern to discharge with highest biomass at intermediate loading rates.

Implications

Climate change has many effects in coastal Louisiana. This analysis shows how increasing river temperature increases growing season length, which affects end-of-season biomass and relative dominance of the most abundant species. Forecasting the land building potential of river re-introductions should include predictions of biomass produced by splay vegetation. This study shows how inter-annual variation in growing season length and river discharge can influence parameter of biomass in several important ways. Additional work is needed to examine the relationship between end-of-season biomass, species composition, and especially primary production. Plant productivity is critical to ecosystem support.

Coastal Protection and Restoration Authority of Louisiana

159 miles
of built or improved levees

19,405 acres
of coastal habitats benefited

$17 billion
in State & Federal funding for protection & restoration

Public Engagement (Room 252)

Moderator: Derek Brockbank

Mississippi River Delta

MRGO Must Go: A Coalition to Restore an Ecosystem

Amanda Moore[1]

[1] National Wildlife Federation, New Orleans, LA

The MRGO Must GO Coalition's work can serve as a model for successful, joint engagement of local communities and coastal experts on complex restoration issues facing the Mississippi River Delta. This Coalition has found success in building political partnerships and shaping restoration recommendations at local, state, and federal levels.

This presentation will focus on the role of community leaders in the MRGO Must GO Coalition, a group of 17 national and local organizations working to restore the Mississippi River Gulf Outlet ecosystem and how the united voice of science, policy, and community concerns has affected change in the planning process for large-scale ecosystem restoration. Since 2006, coastal scientists, landowners, policy experts, and community leaders have shaped technical recommendations to the Army Corps for restoration and earned widespread support including tens of thousands of individuals across the nation.

The presentation will discuss the role of community leaders in shaping restoration policy and the role national organizations can play in elevating the community voice. It will also overview effective community outreach and education, particularly in the Lower 9th Ward and in St. Bernard Parish, our Coalition's working relationship with the Army Corps, and our continuous outreach and advocacy to local, state, and federal officials. We will examine how strategic partnerships can impact restoration planning processes to better reflect independent science and community concerns.

Implications

The MRGO Must Go Coalition impacts the future of restoration, protection, planning, and implementation in the Gulf Coast Region by providing outreach to the community and affiliated institutions. It reaches out to restoration advocates and is committed to creating resilience in the MRGO ecosystem. By achieving widespread support, the taskforce hopes to spread its message to others in order to collectively achieve restoration goals of the coastal region.

Grassroots Community Involvement in Coastal Planning

Sharon Gauthe[1]*, Patty Whitney[1]*

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This presentation focuses on the importance of grassroots community participation in coastal planning and management, with ideas for ensuring that voices of the community are pro-actively included in a timely fashion in the decisions which effect their lives and futures.

"Public Comment versus Public Input" defines the goals needed for successful planning for communities and the residents of coastal zones in Louisiana. This session will explore the differences in the methods and outcomes from a community point of view between "public comments" and true "public input."

Understanding and involving communities is as critical to the success of coastal planning as are the scientific and technical aspects of restoring land or protecting critical assets, but this is usually the least discussed or included topics in the planning process.

Implications

This presentation aims to increase the participants' knowledge of and focus on how to fully include impacted community voices in planning for their own futures in a coastal zone. In very dynamic environments where implications of coastal changes have significant impacts upon residents, planners can use the strategies outlined in this session to develop a more significant communication with local communities, which can ultimately lead to more positive and sustainable community decisions and attitudes.

Citizen Engagement for Coastal Management and Planning

Melanie Sand [1]

[1] *UNO-CHART, 2000 Lakeshore Drive, New Orleans, LA 70148 USA*

Inherent in the notion of coastal master planning is a discourse on policy structure and citizen engagement. The purpose of this presentation is to examine the potential of our local citizens to effectively engage in restoration decisions within the coastal communities of Southern Louisiana. In the face of coastal erosion, land subsidence, and a severe loss of biodiversity, many coastal parishes will soon disappear altogether without a serious attempt to reverse devastating land practices. The enormity of the coastal crisis is clear to many of Louisiana's residents, and they are prepared to fight for the land they call home.

Citizen engagement, though often considered to be merely a single planning tool among many, is vital for any successful planning outcome. The University of New Orleans Center for Hazards Assessment, Response and Technology (UNO-CHART) advocates for more resilient ways of thinking as it pertains to the future of Louisiana's coast. CHART is currently facilitating active citizen participation for coastal management within communities of Plaquemines Parish, while applying methodologies of Participatory Action Research (PAR). Plaquemines Parish residents are richly diverse in their culture and grounded in their environment. CHART has been working with local people and citizen groups to utilize and advocate for traditional ecological knowledge as a tool for adaptation in response to coastal change and elevated risk. Throughout the process, CHART has worked with various groups to identify community visions, develop historical understandings as it pertains to adaptation, provide outreach for various stakeholders, and collaborate in community meetings to reflect upon knowledge.

In particular, this presentation will draw upon its experiences working with local and indigenous peoples as it pertains to current coastal policies. Coming to the forefront, these citizens have been examining opportunities for collaborative practices which may reconcile conflicts between physical science and traditional ecological knowledge. In addition, this discourse will apply collaborative participatory theories borne by senior urban and regional planning practitioners and academics, affiliated with the most prestigious universities of the United States and beyond. Can our citizens effectively engage in coastal planning and restoration? What should their role be in affecting positive change? The goal for achieving true sustainability and resilience requires a balance of social, economic, and environmental considerations. How do public perceptions of sustainability affect our coastal landscape? Ultimately, the goal for this session is to facilitate a discourse and raise questions.

Implications

Citizen engagement directly impacts the future of coastal restoration, preservation, planning, and policy. A discourse on citizen engagement for coastal planning and management will inform the community of the work at UNO-CHART and other agencies in capturing coastal knowledge and concerns from the inhabitants of Plaquemines Parish. By listening to their suggestions and considering their local knowledge, the academic, scientific, and planning communities may come one step closer to reconciling conflicts between science and traditional ecological knowledge.

Keynote Speaker

Tuesday, June 26 12:00-1:30

Dr. Charles "Chip" Groat

President, The Water Institute of the Gulf

Charles "Chip" Groat, Ph.D., is the founding president and CEO of the Water Institute of the Gulf. Groat is a globally recognized expert on earth sciences, energy, resource assessment, groundwater issues and coastal studies. Along with the decades of experience he brings from the United States Geological Survey, academia and as a world-class scientist whose recent research has focused on energy and water resources, Dr. Groat spent many years developing an acute understanding of the needs of our coastal areas in Louisiana. Most recently, Groat has served as the director of the Center for International Energy and Environmental Policy and associate director of the Energy Institute at The University of Texas at Austin, where he has held the John A. and Katherine G. Jackson Chair in Energy and Mineral Resources at the Jackson School of Geosciences. He served as director of the U.S. Geological Survey under Presidents Bill Clinton and George W. Bush. He has extensive experience as an educator and government scientist, including time spent at Louisiana State University and the Louisiana Department of Natural Resources.

Concurrent Session VI

Tuesday, June 26 1:30-3:00

Alternative Shoreline Protection (Room 257)

Moderator: Tyler Ortego

ORA Engineering

Bio-Engineered Oyster Reef Demonstration Project

Matthew Campbell[1], ***Josh Carter*[1]**, *Kenneth Bahlinger*[2], *Tye Fitzgerald* [2], *John Foret*[3]

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[2] *Louisiana Coastal Protection and Restoration Authority*

[3] *National Oceanic and Atmospheric Administration*

Areas of Louisiana's coastline comprised of "weak" soils (low bearing capacity) create unique challenges to coastal engineering related to shoreline erosion protection and wetland restoration projects. These types of coastlines complicate (and sometimes preclude) the use of typical engineering measures for shoreline erosion protection and coastal restoration and require non-traditional techniques and technologies. One of these non-traditional measures, the Oysterbreak™ System, was sponsored by National Ocean and Atmospheric Administration Fisheries Service and selected by the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) Task Force as a demonstration project with the goal of evaluating the Oysterbreak system's capability to reduce and/or prevent shoreline retreat and wetland loss on the open coast of

Louisiana, and to compare the performance of the Oysterbreak system with traditional coastal engineering solutions, such as rubblemound structures. The selected project site is located on the Gulf Shoreline of the Rockefeller Refuge in Cameron Parish, Louisiana 2.5 miles west from the mouth of Joseph's Harbor Bayou.

The Oysterbreak is a patented technology developed by ORA Technologies, L.L.C. designed to use the oyster's inherent nature of clustering to form a coastal protection structure. The system's design, as proposed by the developer, is to be used as an alternative to traditional rock structures. The Oysterbreak units are to be composed of Oysterkrete®, which is a marine grade cement based material designed to provide a suitable surface for oyster growth and increase oyster growth over traditional cement.

Various shoreline protection alternatives were developed including structures made of Oysterbreak units and similar structures (in terms of geometry) composed of rock. The alternatives were developed with the local geotechnical properties controlling the geometrical parameters of the structure, focusing on balancing the structure weight with the allowable soil bearing capacity which dictated the allowable structure height. The alternatives were evaluated relative to existing conditions and each other. The evaluation included the structures' performance in terms of shoreline response, geotechnical and hydrodynamic stability, and constructability. The evaluation of alternatives was conducted using analytical and numerical modeling including 2D-V and 3D Volume of Fluids numerical models to simulate wave transmission through the structures as well as to compute the stability of individual units.

The evaluation of alternatives showed that the Oysterbreak structures performed better than rock structures. The lower density of structures composed of Oysterbreak units allows for higher structure crest heights when compared with rock structures in the weak soils at the project site. Due to the higher crests, the Oysterbreak structures performed better than the rock structures, especially in terms of wave energy reduction and shoreline response. An analysis of the structural integrity of the individual Oysterbreak units under loading from Category 1 hurricane conditions showed that the units would not break due to the wave forces. Compared to rock structures, the Oysterbreak units were more stable due to larger unit weights made possible by the lower overall structure density; the rock structures were not stable enough to meet the design criteria of withstanding a Category 1 hurricane.

Implications

The challenge in coastal Louisiana has been implementing substantial shoreline protection structures in low bearing capacity soils. The Oysterbreak technology was shown in this project to be a viable solution in coastal areas comprised of low bearing capacity soils subject to Gulf wave conditions. The results from this project will allow for the further implementation of this technology in other parts of coastal Louisiana.

Scaling Up Oyster Reef Restoration in Louisiana: Science-based Decision Support for Maximizing Project Success

*Bryan P. Piazza[1], **Seth Blitch[1],** Zach Ferdana[2], Ashby Nix[3] and Megan K. La Peyre[3,4]*

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[2] The Nature Conservancy, Global Marine Team, Seattle, WA

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[4] U. S. Geological Survey, Louisiana Fish and Wildlife Cooperative Research Unit, Baton Rouge, LA

A primary goal of coastal restoration in Louisiana and across the northern Gulf of Mexico is to achieve habitat restoration at an ecologically meaningful scale. For oyster reefs, this means conserving and restoring enough three-dimensional reef habitat to provide adequate return across a suite of ecosystem services that are provided by natural reef habitat (i.e., nutrient cycling, fisheries habitat, shoreline stabilization and protection). However, achieving restoration at appropriate scales is challenging due to uncertainty and natural variation in environmental and socio-economic conditions that are inherent in estuaries and society. These uncertainties can have marked effects on the probability of achieving long-term project success.

We describe the role of pilot projects, scientific monitoring, and an online decision support tool in efforts to bring oyster reef restoration to the appropriate scale in Louisiana. The Nature Conservancy (TNC) has built over four miles of living shoreline oyster reefs in Louisiana and is using variation in material type and reef design to empirically test restoration success across a range of materials and environmental conditions. In addition, TNC and its partners have created an online Gulf of Mexico Decision Support Tool (DST; www.gulfrestorationds.org), so that coastal decision-makers and restoration professionals may consider how multiple ecological and socioeconomic factors may contribute to the success of oyster reef restoration projects. The DST allows users to view a number of ecological (i.e., salinity, depth, existence of historic oyster reefs) and socioeconomic (i.e., coastal employment, distance to marinas.) variables either separately or simultaneously through a module called the "Oyster Restoration Dashboard." The dashboard also allows multi-factor decision support by providing scenario projections of a project's relative chance of success within a given geography in both tabular and map format. Further, the ability to adjust factor weighting in the dashboard allows for comparison across different project alternatives and stakeholder values. The DST is not only continually updated to include new information, but it also provides a template for designing research to improve its ability to analyze scenarios at finer resolution.

Implications

The major goal of this work is to facilitate large-scale oyster reef restoration in Louisiana and across the northern Gulf of Mexico by providing information and decision-support tools to inform the future design, placement, and planning of oyster reef projects.

Flow Field Analysis of a HESCO® Delta® Unit Submerged Breakwater/Living Reef System

***Craig A. Taylor[1],** Paul T. Eickenberg, PE[2]*

[1] University of Minnesota - St. Anthony Falls Laboratory, 2 3rd Ave SE, Minneapolis, MN 55414

[2] HESCO Bastion Environmental, Inc.

Flow fields around a pervious submerged breakwater provide key information about how the breakwater will function as a sustainable living reef. Physical models and infield structures were studied to evaluate the potential use of the HESCO Delta unit as a submerged breakwater/living reef system. Physical Froude scaled models were constructed and tested at 1:5 scales.

The first phase of the analysis focused on horizontal loading on the breakwater/living reef system due to wave action. The second phase of the analysis focused on flow visualizations around the breakwater. Flow visualizations were able to qualitatively identify how and where waves break over the structure, locations of increased flow through the breakwater, and locations for potential bed scour. Field studies consisted of mapping velocity patterns around a full-scale breakwater/living reef system. These velocity patterns were used to map locations on the breakwater/living reef system that were most likely to support dense colonization by locally prevalent marine species.

Implications

Significant shoreline is being lost in Louisiana due to erosion from waves. This loss is coming in the form of lost beaches, coastal wetlands, marshes, and reefs. Historically, concrete or rubble-mound breakwaters (whether emerged or submerged) would be placed to minimize this erosion. Our goal with the research discussed herein is to minimize shoreline erosion and purposefully create an underwater habitat for marine life. From a sustainability perspective, we are referring to a system that is living, growing, and natural, while also serving as a nursery or seed-source for local marine life to start from, thereby encouraging further colonization in the area. The results of the research discussed herein indicate that our submerged breakwater/living reef system effectively addresses two needs in a sustainable manner.

Developing the 2012 Master Plan (Room 255)

Moderator: Kirk Rhinehart
CPRA

Decision Criteria used in the Development of the 2012 Coastal Master Plan

***Melanie Saucier*[1], *Joanne Chamberlain*[2], *Chris Sharon*[3], *Natalie Snider*[1], *Stephanie Hanses*[2], *Brett McMann*[2]

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[3] *RAND Corporation, Santa Monica, CA USA*

Louisiana citizens have different but equally valid ways of viewing what should be done to restore and protect their coast. To better take this range of preferences into account, the Coastal Protection and Restoration Authority created a set of decision criteria that represent what is important to coastal residents, business owners, and industry stakeholders. Using these criteria allowed the state to evaluate alternate ways that risk reduction and restoration projects in the 2012 Coastal Master Plan could affect the coast and its citizens.

A set of decision criteria was defined to reflect aspects of the Master Plan's five objectives. Each criterion relates to a specific objective and was calculated or estimated for each relevant project using some combination of project attribute data, estimates from the seven predictive models, and expert judgment. Results showed that many of the decision criteria had no impact on our ability to achieve the Plan's key drivers to maximize risk reduction and land creation for the coast. However, some criteria caused significant declines in our land building potential and a balanced approach was utilized to account for certain stakeholder preferences while not adversely affecting our restoration or protection goals.

This presentation will provide an overview of all the decision criteria as well highlight key outcomes from the following specific criteria: Support for Cultural Heritage (assessing project impacts on people who live in coastal communities and use ecosystem services/natural resources for work or recreation); Flood Protection of Historic Properties (assessing project impacts on reducing flooding of historic properties); Flood Protection of Strategic Assets (assessing project impacts on reducing flooding of assets of state or national significance); Support of Navigation (assessing project impacts on shallow and deep draft navigation); Support of Oil and Gas (assessing project impacts on oil and gas infrastructure); and Use of Natural Processes (assessing project impacts on natural processes along the coast).

Implications

The decision criteria utilized during the 2012 Coastal Master Plan formulation were selected because they represent a wide array of interests and preferences that are important to stakeholders in coastal Louisiana. These criteria were vetted through a 32-member stakeholder group representing an array of coastal interests, and this approach is appropriate for application to future coastal planning efforts. These criteria can be revisited in the future through the CPRA adaptive management program to evaluate project performance in light of meeting the master plan objectives.

Applying a Planning Tool for the Louisiana Coastal Master Plan

***David G. Groves*[1], *Christopher Sharon*[2], *Debra Knopman*[3]

[1] *RAND Corporation, 1776 Main Street, Santa Monica, CA*
[2] *Pardee RAND Graduate School, Santa Monica, CA*
[3] *RAND Corporation, Arlington, VA*

The Coastal Protection and Restoration Authority of Louisiana (CPRA) asked the RAND Corporation to develop a new Planning Tool to support Louisiana's 2012 Coastal Master Plan. This Planning Tool was designed to provide an analytical and objective basis for comparing different risk reduction and coastal restoration projects and for developing groups of projects, or alternatives, for consideration for the Master Plan. The Planning Tool integrates new standardized estimates of project costs, planning and construction duration, and other project attributes along with science-based model estimates of project effects on risk reduction, land building, and ecosystem services. The Planning Tool uses a constrained optimization algorithm to develop a range of alternatives that meet CPRA's desired outcomes with respect to future flood risk reduction, coast-wide land area, and other decision criteria. The Planning Tool presents its results in an interactive visualization environment to support deliberation by CPRA and stakeholders.

CPRA used the Planning Tool to compare hundreds of possible hurricane flood risk reduction and coastal restoration projects under several scenarios of long-term future conditions. CPRA next used the Planning Tool to develop and analyze hundreds of different alternatives that together would best meet Louisiana's goals of reducing hurricane flood risk and achieving a sustainable landscape. The Planning Tool then enabled CPRA to specify planning parameters such as total available funding, funding splits between risk reduction and restoration projects, and minimum levels of projected achievement of goals for ecosystem service and risk reduction decision criteria. Using this information, the Planning Tool then identified how those alternatives could be implemented over the 50-year planning horizon to maximize achievement of Louisiana's risk reduction and land building goals.

The Planning Tool's flexible capabilities allow it to analyze and display complex trade-offs among different alternatives. CPRA was able to use these capabilities of the Planning Tool to support its selection of a specific alternative that serves as the foundation of Louisiana's 50-year $50 billion 2012 Coastal Master Plan. The Planning Tool and supporting models will be used to guide implementation of the Master Plan in the years ahead.


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Implications

CPRA's new Planning Tool was instrumental in providing a scientific and objective basis for evaluating the risk reduction and coastal investments proposed for Louisiana in the 2012 Master Plan. The Master Plan, informed by the Planning Tool and supporting predictive models, provides a comprehensive hurricane flood risk reduction and coastal restoration plan.

Adaptive Management of Louisiana's Coastal Program

***Natalie Snider*[1]*,** *Kirk Rhinehart*[1], *Alaina Owens*[2]

[1] *Coastal Protection and Restoration, Authority of Louisiana, Baton Rouge, LA 70801*

[2] *Brown and Caldwell, Baton Rouge, LA*

The 2012 Coastal Master Plan provides the technical analysis needed to demonstrate that there are dire consequences of no new investment in the coast to the citizens of Louisiana and the rest of the nation, as well as great benefits from financial support in providing for a better future. The master plan is a long-term plan for the coast with clear economic, social and environmental benefits. To be prepared for the complexity and magnitude of implementing this effort, resources must be organized and coordinated to expedite delivery of the risk reduction and land building projects described in the plan. An adaptive management framework that captures this coordination is critical to successful implementation. An adaptive management framework systematically considers new information and changing characteristics of both environmental and social systems in response to project implementation, and when necessary, makes appropriate adjustments at any stage of the implementation process to ensure continued progress toward achieving master plan objectives. The Coastal Protection and Restoration Authority (CPRA) must be able to react and adjust its course to unforeseen challenges in a nimble and strategic way. An adaptive management framework would integrate project design and construction with system level monitoring by creating a comprehensive strategy to identify lessons learned and linking activities within CPRA, The Water Institute of the Gulf and across different state agencies.

An adaptive management framework will be incorporated into five existing focus areas within CPRA: program management, planning, research and development, policy and legal, and outreach and engagement, to deliver the program and maximize collaboration, coordination, and communication. Each of the five focus areas is instrumental to the successful implementation of the master plan, and key information "feedback loops" to the master plan and other coastal program efforts are essential.

Initial development of the adaptive management framework includes: evaluating acceptance of the 2012 Coastal Master Plan, evaluating models, tools, and key uncertainties, developing a strategy for 2017 Coastal Master Plan, developing a budget and priorities for research and development, identifying a governance structure and key roles and responsibilities, developing a panel of experts to guide the adaptive management framework, cataloging on-going monitoring and data collection / identify gaps, determining when and where monitoring might dictate adjustments to the planning process and/or project implementation and operations that would result in a change to how projects interact, are sequenced or whether they are removed from the master plan, developing key questions for implementation (e.g., systems approach/synergy effects and project sequencing), prioritizing and budgeting research and development (including monitoring).

Ongoing studies, like the Mississippi River Hydrodynamic and Delta Management Study will provide critical information for this implementation effort. Independent research institutions, such as the Water Institute of the Gulf, in conjunction with other research, academic and engineering institutions could provide a high level of expertise to build the knowledge needed to support quality project performance.

Implications

A programmatic Adaptive Management Framework will be developed during the initial stages of master plan implementation, which will allow the coastal program to stay abreast of the latest science and technical information, and apply this knowledge to adjust and optimize the master plan and overall coastal program. It will focus on integrating risk reduction and ecological restoration efforts with the institutional knowledge that is built through a strategic and program-wide learning process.

Lessons Learned (Room 253)

Moderator: Maura Wood

National Wildlife Federation

Determining the Performance of Breakwaters during High Energy Events: A Case Study of the Holly Beach Breakwater System

***Andrew Woodroof*[1,2]*,** *Q. Jim Chen*[1]

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[2] Digital Engineering

A variety of empirical models for predicting the shoreline response to breakwaters are available to coastal engineers, including the commonly referenced Dally and Pope, Suh and Dalrymple, and Pope and Dean methods. The primary input parameters for these empirical models are the geometric properties of the breakwater system such as breakwater length, breakwater distance from shore, and gap distance between the breakwaters. While these empirical methods are useful for predicting long term response, they do not account for short term events that can cause large hydrodynamic variations between systems. Recent studies show that the type of shoreline response to a detached breakwater system may vary depending on the level of emergence or submergence of the breakwater in relation to the mean water level. The variance in emergence of a breakwater can strongly affect the nearshore hydrodynamic circulation patterns near the breakwater and, in turn, the shoreline response to the structure. While emergent breakwaters typically induce sediment accretion along the shoreline, recent studies using laboratory and numerical models indicate that overtopped or submerged breakwaters may increase erosion of the shoreline. This variation of the hydrodynamic patterns and shoreline response is of particular interest for breakwaters along shorelines that can be impacted by hurricanes and other events that trigger large variances in water level, as the breakwaters may periodically shift between emergent, partially submerged, and submerged states.

The Holly Beach Breakwater System (CS-01) is one such feature that has been constructed to protect a vital piece of coastline in the southwestern portion of Louisiana. These breakwaters were constructed to protect Louisiana State Highway 82, an important hurricane evacuation route that runs parallel to the coastline along Holly Beach, by preventing beach erosion and inducing sediment accretion along the shoreline. During normal conditions, these breakwaters are fully emergent and can be characterized using traditional empirical methods. However, these breakwaters can frequently be impacted by surge events and become overtopped or submerged and therefore may not always perform as intended. This study uses survey data, aerial photography, and storm data to assess the performance of the breakwater system during different conditions and differentiate the response of the shoreline to the breakwater system during emergent, overtopped, and submerged states.

Implications

Detached breakwaters have been constructed in many areas along Louisiana's coastline to protect the shoreline from wave energy and erosion. During normal conditions, these breakwaters can typically be analyzed using traditional empirical methods for emergent breakwaters. However, Louisiana's coastline is under constant threat from tropical storms and hurricanes, and these breakwaters can frequently become overtopped or submerged systems during such high energy events. Therefore, breakwaters along the Louisiana coastline may not be suitable for typical analysis methods, and should be analyzed using a variety of methods for emergent, overtopped, and submerged breakwaters to fully assess their impacts. Lessons learned from this project will improve the methods used to analyze and monitor shoreline protection systems and serve as a tool for hydrodynamic modeling of breakwater structures.

Getting to the Roots of Successful Coastal Cypress Restoration

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[2] *Independent restoration practitioner, New Orleans, LA*

The search for effective means to restore coastal cypress swamps has challenged scientists and lay people alike for several decades. In southeastern Louisiana, regionally rapid rates of wetland loss and sea level rise have spurred interest in better understanding what biological and environmental factors constrain effective cypress restoration. Using common garden field trials and greenhouse experiments, our goal is to evaluate the importance of genetic variation, restoration site substrate characteristics, and horticultural nurturing practices on the growth and survivorship of cypress seedlings and saplings.

In 2007 and 2008 we established four cypress restoration sites in marshes adjacent to Lake Pontchartrain, and one site in the Bonnet Carré Spillway. Employing a factorial design, we contrasted performance of saplings differing in genetic background and in the size of their root system at outplanting, among sites differing in pore water salinity. We measure survivorship and height growth two to three times each year, and we observe site porewater salinity more frequently. We protect all saplings with plastic 'tree protectors' to deter mammalian herbivores. In addition to interannual variation in weather conditions, this trial experienced two sustained openings of the Bonnet Carré Spillway (2008 and 2011) and storm surges from Hurricanes Gustav and Ike in 2008.

Since 2007, we have observed unusually high cypress sapling survivorship rates in the field trial (all sites >50%, as high as 90%) despite soil pore water salinity measurements at some sites in the 4-7 ppt range, integrated over the 0-50 cm soil depth interval, a salinity level that kills cypress seedlings. Survivorship of saplings planted with intact root systems – in either one gallon or one pint containers – greatly exceeds that of bare root saplings, especially during the first year. Differences in survivorship between saplings raised in containers of different sizes is more complex, as are differences in performance among half-sib groups. Site location (and probably site conditions) influences seedling response to each of these main factors.

We analyze cypress sapling performance in the first 4-5 years of this field trial, and we propose a suite of practical guidelines for practitioners engaging coastal cypress restoration.

Implications

Concern about sustaining and restoring coastal cypress swamps is longstanding and widespread. Much effort has been directed toward restoration efforts, most of which have employed bare root seedlings planted without physical protection from mammalian herbivores. In most cases, restoration managers are also unaware of the genetic source of the cypress stock they plant. Rates of cypress recruitment in these restoration projects have been low. Very few of these restoration efforts have combined rigorous scientific design and evaluation with practical resource management goals. As we move forward with extensive restoration plantings across a wide variety of site conditions, we face an urgent need for intensive assessment of factors likely to influence coastal cypress restoration success. To be effective stewards, we need evaluative guidelines linking cypress performance to suites of co-existing stressors. Five years into this study, it begins to address this need.

Rock, Weirs and Freshwater: A Look Back at Coastal Restoration Projects

Ron Boustany*[1]*, Troy Mallach[1], Loland Broussard[1]

[1] *Natural Resources Conservation Service, 646 Cajundome Blvd, Suite 180, Lafayette, LA 70506*

The CWPPRA program has been actively constructing coastal restoration projects for over 20 years now. Those and other projects have involved numerous strategies and approaches to solving various coastal problems such as shoreline erosion, interior marsh degradation from subsidence and saltwater intrusion, and barrier island protection and restoration. Rock and other hard structures have been used to protect land forms from erosion. Water control structures have been employed throughout the state to manage hydrology by reducing tidal fluctuations and reducing volume transfer of water to manage salinity encroachment. Freshwater diversions have also been installed to manage salinities and, to a less recognized extent, provide nutrients and sediments to degraded marshes that are isolated from riverine influence. So how are these projects doing? CPRA has been monitoring most of these projects since construction and have generated updated reports on performance on a regular basis. Only recently have the monitoring terms for most projects reached enough time (>10 years of data) to provide reliable insight into the performance of these projects. Here we look back at several projects using these reports and other information to analyze projects that have involved hydrologic restoration measures, rock protection features, and freshwater introduction structures to assess effectiveness in terms of estimated and observed benefit. Additional observations of historical project actions, project areas, net benefit projections and cost-effectiveness will be presented.

Implications

As practicing resources managers involved in coastal restoration we are constantly evaluating and reevaluating our past actions to confirm what our expectations were and assist in shaping our future actions. We reviewed the most recent CWPPRA monitoring reports and other data to try to determine if some of the more complex projects that involve hydrologic management and freshwater introduction into broad areas are yielding the positive benefits anticipated in planning. Unlike more direct action projects that involve specific areas, like marsh creation, the effects of these projects can be so widespread that it is takes time to determine benefits and requires analysis of landscape-level trajectory information (i.e. land-water trends). As we approach 10+ years of monitoring information on some of these projects, we are able to more reliably evaluate how well or not so well some of these projects are doing.

Tools and Data for Local Stakeholder Engagement (Room 252)

Moderator: Susan Testroet-Bergeron, CWPPRA

Best Practices Manual for Development in Coastal Louisiana and Coastal Louisiana Land Use Toolkit

Camille Manning-Broome[1]

[1] *Center for Planning Excellence, 100 Lafayette Street, Baton Rouge, LA 70801*

Center for Planning Excellence partnered with the Office of Coastal Protection and Restoration to create a Best Practices Manual for Development in Coastal Louisiana that informs the Coastal Louisiana Land Use Toolkit. The Best Practices Manual is designed to be an easy, informative resource for anyone who wishes to utilize coastal land use and development strategies and best practices. The Coastal Toolkit is a set of model regulations appropriate for the coastal environment that can be tailored and implemented cafeteria style by local decision and policy makers. Both documents are available at www.cpex.org.

With two questions in mind: What can we do to resiliently live and work in the coastal environment? and How can we do it? we developed the Best Practices Manual. This Manual provides an overview of why it is needed; showcases how people deal with water elsewhere around the globe; contains a brief history of the unique development patterns in Louisiana as well as social, cultural, economic and environmental conditions of today; and provides an overview of the six different geographical patterns found in Louisiana – which we call Geotypes. Building on this information, the Manual contains a series of strategies at multiple scales—site, building and community scale. The strategies are supported by best practices and concern planning and education, infrastructure design, storm water management, and site design. The Manual closes with an overview of how to implement the strategies and finally presents coastal development standards that reinforce and provide a way to implement the suggested strategies in communities of all sizes. The information in the Manual along with FEMA's Community Rating System provided the framework for the development of coastal model regulations. These regulations, available as the Coastal Louisiana Land Use Toolkit, focus on natural resource protection and hazard mitigation. Implementation of the Coastal Toolkit enables coastal communities to further maximize insurance premium discounts and better protect assets and natural resources while improving quality of life through more guided development and redevelopment.

Implications

The Best Practices Manual for Development in Coastal Louisiana is designed to be an easy, informative read for anyone who wishes to learn about coastal land use and development best practices. Using the Manual will inform the reader about measures that individuals as well as communities can take to successfully live in the coastal environment and thereby increase their resilience. These measures include securing homes to creating community plans to implementing coastal specific regulations. These regulations, available as the Coastal Louisiana Land Use Toolkit, focus on natural resource protection and hazard mitigation measures. Based on FEMA's Presentation.

Community Rating System, implementation of the Coastal Toolkit enables coastal communities to further maximize insurance premium discounts and better protect assets and natural resources while improving quality of life through more guided development and redevelopment.

Social-Ecological Mapping for Project Integration

Kristina Peterson **[1],** *Melanie Sand*[1], *Greg Rigamer*[2], *Billy Guste*[2]

[1] *UNO-CHART, 2000 Lakeshore Drive, New Orleans, LA 70148*

[2] *GCR, Inc.*

Often community members, non-profits, agencies, academics and political leaders are not aware of the various coastal restoration activities, projects, and research that are occurring in their own "back yard." A comprehensive list of current and potential projects as well as research, resources, needs, and community links is virtually nonexistent in Louisiana. As a result, this lack of information creates an inefficient and ineffective use of resources.

The University of New Orleans Center for Hazards Assessment, Response and Technology (UNO-CHART) has partnered with GCR, Inc., a local consulting group, to develop a user-friendly integrated mapping and reporting tool to provide information to multiple stakeholders. The tool's function is to house and map critical information on a jurisdictional basis regarding academic research initiatives, volunteer opportunities and initiatives, and federal, state, and local projects. This interactive mapping and reporting tool will foster collaboration amongst levels of state and local government, agencies, interest groups, the academic community, and local citizens. As an online tool, this project would include demographic and population information, strategic infrastructure, schools, businesses, etc. It could also be utilized to identify impacted population, coordinate volunteer efforts and research initiatives, and further ensure local coastal restoration activities are complementing larger scale efforts administered at the State and federal levels. This tool has an advantage over traditional GIS systems in its ability to create reports to assist decision making processes.

The primary goal for the integration mapping system is to facilitate the formation of viable partnerships based upon resource needs. In addition, the project will promote better forms of resource management by reducing research and service overlap within the community. Finally, the program will be user-friendly, allowing for access by citizens as well as professionals, scientists, and academics. In doing so, the tool aids in local engagement for restoration projects along a broad spectrum from the macro to micro scales. For example, a university from somewhere within the country may be searching for a project in which to involve students. The integration mapping system can be accessed via a search engine and will provide applicable information about current research, project availability, and resource needs. Thus, Gulf Coast restoration will attract more attention, not only locally, but nationally. This session will demonstrate the integrated mapping system and highlight its multiple applications and community benefits.

Implications

UNO-CHART and GCR, Inc. plan to impact the future of coastal restoration within the Gulf Coast Region by facilitating resource linkages and disseminating information, not only locally but nationally. Through the use of ESRI mapping technology, restoration projects and resources will be searchable to all via the web. By integrating information on a large scale, social-ecological data will open the door to individuals and institutions wishing to contribute to the creation of a sustainable coast. The objective, in essence, is to empower our people to accomplish the many coastal objectives discussed in this conference. Similarly, it will organize and share information which may be used to guide future planning and policy decisions. In summary, social-ecological mapping for project integration is a tool which could benefit anyone involved in coastal restoration and preservation through the power of information-sharing.

Voter and Community Attitudes toward the Mississippi River Delta and Louisiana's Coast: Implications for Building Political Will for Restoration and Sustainability

***David J. Ringer*[1]*,* *Scott Madere*[2]
[1] *National Audubon Society*
[2] *Coalition to Restore Coastal Louisiana*

First-of-its-kind national opinion research conducted in 2011 reveals voters' perceptions of the Mississippi River Delta and Louisiana's coast and their willingness to support proposed short-term and long-term measures to promote restoration and sustainability of the region. The 2010 BP oil disaster is seen almost universally as a defining moment in the United States' relationship with the Gulf Coast and Mississippi River Delta, but previous events, including Hurricane Katrina, and long-held cultural, historical, and economic associations also shape voters' perceptions.

Within Louisiana, research conducted in 2012 in the context of the release of the 2012 Coastal Master Plan and building on research conducted in 2008 among south Louisiana voters begins to reveal contemporary attitudes toward proposed restoration and sustainability measures.

Implications

Connecting scientific and public policy information with the values held by voters and activists and communities is essential to building short-term and long-term support for restoration and sustainability measures. Information that does not connect with individually and culturally held values – or that is perceived to threaten such values – will be suppressed, denied, or resisted by powerful psychological and cultural forces, resulting in inaction or in counterproductive actions, an outcome seen in a number of recent environmental and social change campaigns. Recent research reveals both opportunities and cautionary notes for all those working to promote coastal restoration and sustainability. By adopting values-based communication practices guided by ongoing research, restoration and sustainability advocates can build a powerful, well-supported cultural and political movement to achieve a desperately needed shift in the United States' relationship with one of its most important natural resources.

Plenary Session I

Tuesday, June 26 3:30-5:00

"Achieving More Sustainable and Balanced Management of the Lower Mississippi River"

This moderated discussion of the Lower Mississippi River focuses on the river's role in restoring deltaic wetlands as well as the challenges facing the effective management of the river in the future. Invited speakers will discuss the river's historical and current roles, its desired future state and the key political, environmental and social drivers which change and influence the Lower Mississippi River. Particular emphasis will be placed on the river's role as an economic driver and provider of resources for Louisiana and the nation. Panel participants will also speak about the process for making management decisions regarding the Lower Mississippi, and how those decisions will affect the course of a new Mississippi River.

Panel Moderator:

Dr. Clint Willson, PE
Associate Professor, LSU

Panel Participants:

Richard Campanella
Geographer

Gary LaGrange (invited)
Port Director of New Orleans

R. King Milling
Chair, Governor's Advisory Commission on Coastal Restoration and Protection

Major General, Retired, Thomas Sands
former President Mississippi River Commission

Concurrent Session VII

Wednesday, June 27 8:30-10:00

Socioeconomic Impacts of Hurricanes (Room 257)

Moderator: Rex Caffey
LSU

Forecasting Subsidence across Louisiana's Coastal Plain: Challenges to Evacuation Resiliency

***Joshua D. Kent*[1]**
[1] *Louisiana State University, Center for GeoInformatics, 219 Engineering Research & Development Bldg., South Stadium Drive, Baton Rouge, LA 70803*

It is well understood from geologic studies that the processes responsible for the Louisiana coastal plain of the late Holocene was primarily dominated by the interaction between sedimentary accretion, geologic subsidence, and global sea level change. The alternating cycles of flood induced deposition and naturally eroding landforms resulted in a relative equilibrium from which the coastal wetlands were maintained. It is also recognized that contemporary human manipulation of this landscape has severely disrupted the natural sedimentation and hydrology that had previously sustained the plain for hundreds of centuries. Consequently, many coastal wetlands have been deprived of the sediment-laden floodwaters that naturally replenished the subsiding coast, thus making the landscape more vulnerable to storm surge, seasonal flooding, and global sea level rise.

Relative sea level rise is the apparent downward movement of the Earth's surface with respect to a reference point or datum. There are multiple, often overlapping natural and anthropogenic factors that contribute to this phenomena, which include eustatic sea level rise, sediment compaction and consolidation, faulting, load-induced flexure, fluid extraction, forced drainage, organic decomposition, and more. Indeed, studies have found that Louisiana's coastal plain experiences subsidence at rates as great as 60 millimeters per year, with discrete extremes observed throughout the region. When combined with the predicted effects of global climate change, a rapidly subsiding coast will present significant and long-term sustainability and resiliency challenges, which are expected to include more frequent and widespread seasonal flooding, deeper penetration of storm surge into the coastal zone, and substantial retreat of low-lying coastal wetlands.

This presentation will examine the application of steady-state subsidence forecast models for estimating surface elevations of Louisiana coastal plain through the remainder of the century. Geophysical and anthropogenic subsidence estimates were derived from on-going empirical studies published in contemporary scientific literature. Forecasted elevation changes were subtracted from digital elevation models to identify vulnerable populations and emergency evacuation routes. Surfaces predicted to be at or below 0.0 meters in elevation, relative to the North American Vertical Datum of 1988, were identified and quantified by parish. The results from this analysis have been used to estimate the long-term subsidence risks for existing communities and emergency evacuation strategies.

Implications

Subsidence exerts enormous influence on Louisiana's coastal wetlands. The risks associated with inundation hazards are considerable. Providing a mechanism for visualizing and quantifying our vulnerabilities and risks are critical for ensuring sustainability and resiliency of our coastal communities. The findings from this research can provide community planners, emergency managers, and transportation engineers with research that was previously unavailable. These results are applicable for evacuation modeling, hazard mitigation, environmental sustainability research, costal restoration efforts, and more.

Integrating Social Vulnerability into Multiple Lines of Defense Mitigation for Floods

*Steven M. Ward [1], **Chris T. Emrich [2]***

[1] *G.E.C., Inc., 8282 Goodwood Blvd., Baton Rouge, LA 70806*

[2] *University of South Carolina HVRI, Department of Geography, Callcott, Room 311B, Columbia, SC 29208*

The North Shore of Louisiana's Lake Pontchartrain experienced a population boom during the past five years related to the out-migration of Southern Louisiana and New Orleans during post-Katrina recovery and reconstruction (Kates et al 2006, Hori 2009). Dynamically linked to this influx of people are likely changes in the underlying socio-economic and demographic character of the region (Landry et al 2007, Myers et al 2008). These characteristics of the new immigrant population interact in various combinations to produce new geographic patterns of vulnerability, exacerbate existing vulnerabilities, or mitigate vulnerabilities to flood hazards and disaster events (Cutter et al. 2003, Hori et al. 2009). Identifying and understanding these vulnerabilities is an important step in the ongoing processes to plan for and mitigate future flood related losses. Effective plans accounting for differences in hazard threats and exposures across space can be made if the social vulnerability is also revealed and understood.

To that end, this study expanded upon the 2011 Northshore Hurricane/Flood Protection and Restoration plan; and focused on identifying, analyzing, and explaining the baseline (pre-event) conditions of North Shore populations in relation to existing and potential future threats from flood hazards. Utilizing both decennial (census 2000) and more frequent American Community Survey (ACS) five year data coupled with known flood hazard data provided a basis from which to examine differences in both biophysical (flood hazards) vulnerability and social vulnerability (US Census 2000, US Census 2009, US Census 2010). These combine across the physical landscape to create overall place vulnerability – or the dynamic intersectionality of physical threats and ability (or lack thereof) to adequately prepare for, respond to, and rebound from these threats (social vulnerability).

By incorporating both the biophysical vulnerability and the social vulnerability into a "place" vulnerability metric for the study area, the authors have been able to gain a more robust understanding of the flood risks across the region. By integrating this new understanding of risk into potential mitigation strategies, planning for risk reduction expenditures can more appropriately consider the drivers of place specific vulnerability.

Implications

Continued population growth and development in vulnerable geographies across Coastal Louisiana has created a new geography of hazards and disasters within the coastal zone. Increasing storm frequencies coupled with sea level rise will undoubtedly intensify the intersection between flood hazards and coastal residents. Accordingly, the baseline (inherent) capacity of places to adequately prepare for and rebound from disaster events will be negatively impacted.

The long term benefit of accounting for social vulnerability will result in a positive influence on planning activities in the area, but more importantly allow for a refined implementation of coastal restoration projects. By focusing on both the environmental and social benefits of project implementation, the state can increase justification of project funding while expanding project benefit. This technique provides value in that it enables planners to apply a more utilitarian approach to decision making related to mitigation and restoration activities highlighted in the State Master Plan.

Forecasting Structure Development in Coastal Louisiana

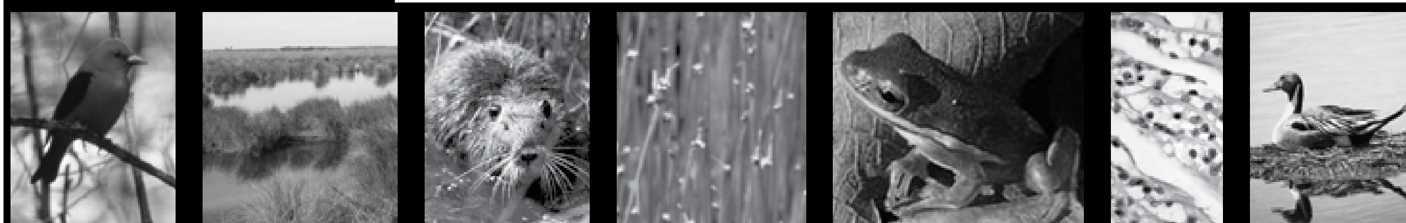
Joseph Berlin[1]

[1] *URS Corporation*

Forecasts of the future structure inventory are necessary for estimating the benefits of federal flood risk management projects, as the primary benefits of these projects are flood damages avoided. The life cycle of federal flood projects is 50 years and the structure inventory of the project study area, both residential and commercial, is generally expected to change significantly during that timeframe. Structure inventories and forecasts were recently conducted for much of coastal Louisiana, specifically for the Donaldsonville to the Gulf Project, the Morganza to the Gulf Project and the Larose to Golden Meadow Project.

Structure forecasts were developed by parish based upon projected population growth and employment growth. The exact location of future structures was forecasted based upon the current location of structures and development trends. The size and configuration of new structures was forecasted to estimate the value of future structures. Key inputs to estimating flood damages avoided are structure values, value of structure contents, structure elevation, and structure location.

The forecast of residential structures was based upon population growth for each parish and the forecast of commercial structures was based upon employment growth for each parish. The HEC-FDA software used to estimate flood damages avoided is based upon three residential categories (single family, mobile home, and multi-family with less than four units) and seven commercial categories (retail, wholesale, service, office, multi-family, restaurant, and government) of structures. The proportion of residential structures in each category was not forecasted to change. The development of future commercial structures was considered to be dependent upon employment growth in relevant employment categories. For example future retail structures were forecasted based upon future retail employment. Building permit data was used to forecast the elevation and location of future structures.



Louisiana has seen slow growth for the past 30 years, relative to the U.S. economy, and most economic forecasts expect continued slow growth during the next ten years. Therefore the forecast of new structures in the study areas was lower than the national average. The forecasted new structures are expected to be located in urban areas, near industrial development.

Implications

Several structure development trends are evident that will impact the configuration of federal projects. Although coastal Louisiana is primarily rural, new structure development is concentrated in larger urban areas, such as Houma, rather than small towns and outlying areas. New residential development is built at higher elevations, to meet elevation requirements for flood insurance, and therefore less flood-prone. These structure development trends favor federal projects that protect the most densely populated areas over continuous levee systems that protect the entire coastline.

Delta Evolution (Room 255)

Moderator: Kurt Johnson
DOTD

New Chronological Data for Mississippi River-Mouth Shifting and Chenier Plain Development: Do They Match?

***Marc P. Hijma*[1]*,** *Zhixiong Shen[1], Torbjörn E. Törnqvist[1], Jennifer I. Kuykendall[1]*

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In the past, the Mississippi River has shifted its course frequently, resulting in distribution of sediments along the coast and 'healing' of scars in the coastline. The existing time-control of these shifts is still predominantly based on research from the 1940-1960s. Since then, the accuracy of radiocarbon dating and sampling strategies has increased significantly and this has led to substantial revisions. For instance, re-dating one of the shifts of the Mississippi River resulted in an age that differs up to 2,000 years from previously established ages. This shows the need for new, high-resolution chronological data, in order to better understand the natural behavior of the Mississippi River.

The Mississippi River delivers large amounts of muddy sediment to the Gulf of Mexico. West-ward directed longshore currents transport part of this sediment to the Chenier Plain, a 200 km long and 30 km wide low-lying marsh area in western Louisiana. It consists of alternations of muddy, marshy areas with sandy ridges (cheniers) in between. The chronological work on Chenier Plain development also stems from decades ago (1950s) and ridge formation was dated using reworked shells, dating the oldest chenier to ~3,000 cal yr BP. Ever since that time, Chenier Plain development has been linked to Mississippi River development. The hypothesis is that when the mouth of the Mississippi is situated close to the Chenier Plain, the abundance of muddy sediments will lead to seaward growth of the coastline. When the Mississippi shifts to a more easterly position, mud delivery is reduced and waves erode mudflats and form cheniers. However, current chronologies for Mississippi River-mouth shifting and Chenier Plain development do not show a clear 1:1 relationship and therefore it has been suggested that local river systems have a strong influence on Chenier Plain development as well.

As outlined above, existing chronologies were established decades ago. We gathered new data to improve the chronologies with the aim to test the influence of Mississippi river-mouth shifting on Chenier Plain evolution. We have used both radiocarbon and Optically Stimulated Luminescence (OSL) dating. With the latter technique the age of sandy cheniers, and also of sandy Mississippi River deposits can be determined directly. We have collected numerous samples from chenier ridges west of the

Mermentau River and from carefully selected sites in the Mississippi delta. Each sampling site was chosen after extensive fieldwork (coring) to obtain a detailed stratigraphic framework. For radiocarbon dating we sampled peat layers and selected macrofossils for AMS-radiocarbon dating. The OSL ages for the chenier ridges are in good agreement with the radiocarbon ages from the 1950s, meaning that the oldest, most inland Little Chenier formed just after 3,000 cal yr BP, while the other dated chenier ridges span the time interval 1,200-2,600 yr BP. During the last 3,000 yr, the general framework indicates that the St. Bernard, Lafourche, modern-Plaquemines, and Atchafalaya subdeltas have been active. We will discuss and compare the chronologies of these subdeltas with those of the cheniers. Do they match?

Implications

The current fixed position of the Mississippi River results in large, sediment-starved sections that erode rapidly. Controlled Mississippi River diversions to such sections constitute a key element to coastal restoration with the goal to achieve sediment accretion rates that keep pace with future relative sea-level rise in strategically selected areas. Geological information of past river-mouth switching can provide insights as to whether rapidly subsiding areas can be saved by river diversions and how fast this process can be. In addition, river diversions will likely affect areas well to the west of the mouth as sediments will be transported by the westward directed offshore current. Better understanding the link between Chenier-Plain development and the position of the Mississippi River mouth, and hence the distribution of sediment, can help improve forecasting of coastal responses to river diversions.

Predicting the Response of the Mississippi River Delta to Permanent Changes in Natural Processes

***Erol Karadogan*[1],[2],** *Clinton S. Willson*[1]

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[2] *Dynamic Solutions LLC*

Strategies offered within the draft 2012 State Coastal Master Plan for slowing down or reversing the current trend of degradation of the southeastern and central Louisiana coastal ecosystems include diverting sediment and water from the Mississippi River into adjoining drowned areas, where the inorganic and organic sediment can create new land and provide a platform for regenerating wetland ecosystems. Predictions for delta restoration projects that aim to replicate natural delta building processes require sufficient understanding of the spatial and temporal characteristics of sediment supply and the implications of relative sea level rise.

ADH (Adaptive Hydraulics) is the modern, multi-dimensional, finite element hydraulic modeling program in development by the Coastal Hydraulics Laboratory of the U.S. Army Corps of Engineers (USACE) Engineering Research and Development Center (ERDC). The 2D Shallow Water Module of ADH coupled to its Sediment Transport Module (SEDLIB) is being used to model sediment transport over a 130 mile stretch of the Mississippi River (from Carrollton to the Gulf of Mexico). The hydrodynamics model has been calibrated and verified under several different flow and tidal conditions using stage data collected from 14 stations and recent discharge observation data obtained from USACE New Orleans District published reports and databases for the Mississippi River, distributaries and passes in the study reach. The suspended sediment transport model is verified using limited suspended sediment concentration measurements, river bed analysis and channel condition surveys. In this presentation, we will present our efforts to investigate the effects of relative sea level rise on the reduction in the sediment supply, due to decline in the capacity of the river to carry water and sediment, at six potential sediment diversion locations being proposed, including Black Bay, Braithwaite, Violet, White Ditch, Myrtle Grove and Empire.

Implications

Long-term performance and optimization of sediment diversions requires an understanding of current conditions and future projections of the lower river. Two-dimensional models fill an important gap between one-dimensional models, which can provide semi-quantitative results over extremely long time frames (e.g., decades) and three-dimensional models, which can be used to examine fine details over small reaches and time scales. This work describes the application of a two-dimensional hydrodynamic model of the Lower Mississippi River that has sufficient spatial and temporary resolution to capture the important temporal and spatial forcings and can provide quantitative measures to assess future performance of sediment diversion projects. These results can help identify suitable diversion locations, frame research questions and provide guidance for the design and management of the Lower Mississippi River Delta system. Water discharge and sediment loading model results at the cross-sections just upstream of proposed diversion structures will be used to imply the availability of the coarse sediment in the river for those wetland restoration projects.

Incipient Formation of a New Distributary of the Mississippi River within the Bohemia Spillway, Southeast Louisiana

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The Bohemia Spillway area is an 11.8 mile reach on the east bank of the Mississippi River approximately 45 miles downriver of New. The Bohemia Spillway was created in 1926 when the artificial Mississippi River levees were removed, which re-established more natural conditions of overbank flow across the natural levee. Because wetlands here are more resilient, LPBF has been investigating the Bohemia Spillway, to document processes that may be emulated elsewhere for coastal restoration.

During the course of hydrologic surveys in the waning phase of the 2011 Mississippi River flood event, we observed a process of overbank flow developing into a channelized flow at two locations. At both sites, the roadway along the crest of the natural levee was breached by a new channel that previously was simply overtopped.   At one site, the new channel breaching the roadway is approximately 150 feet wide and 25 feet deep relative to the roadbed, which is + 6 to 7 feet NAVD. The new roadway breach channel connects two small pre-existing canals that are aligned with one extending toward the marsh and the other towards the river. The roadway breach connects the channels into a new composite channel now extending from the marsh across the road and to a forested bar along the river bank (+ 4 to 5 feet NAVD).

In July 2011, with the river stage at Pointe a la Hache was 5.5 feet, we estimated the flow through the roadway breach channel breach was 5,000 to 7,000 cfs, which is significantly greater discharge estimate than when the river crested a few weeks earlier at 7.5 feet.   The greater discharge was due to the hydrologic efficiency created by the new composite channel.   The increase in channel discharge triggered channel adjustment, including erosion and deposition. Both of the pre-existing canals connecting on either side of the roadway breach have significantly increased in depth and width with numerous scour holes and bars.   At the end of “spring” high water in late July, we observed vigorous headward erosion into the river bar.   The channel water depth at the headward erosion approximately 7 to 10 feet, suggesting the thalweg elevation is –2 to 3 feet. The headward erosion ceased in July, but was renewed with high water events in December 2011 and February 2012. At this time the closest approach of the headward erosion to the river bank across the bar is approximately 100 feet.

It is likely that if headward erosion continues with the high water season in 2012, the new channel will have breached entirely across the bar, creating a continuous channel from the river to the marsh with a negative thalweg elevation, and thus become a continuously flowing new distributary of the Mississippi River. However, the process of headward erosion may be stopped, since there is a pending permit application to repair the roadway.   This development would conflict with the state’s draft master plan which proposes a large diversion precisely at the site of the incipient breach at a cost of $219,000,000.

Implications

The Bohemia Spillway is a truly unique setting to investigate processes that are vital to sustaining Louisiana's coast. The wetlands are healthier and more resilient in-part due to the river discharge. The incipient distributary formation is a sub-set of processes that we can observe and monitor their effect on the wetland landscape. The permit to repair the roadway would stop the distributary formation. The situation illustrates the complexity of intersecting interests of coastal restoration such as, private land owners and oil and gas interests. The breach itself, if it were allowed to completely develop into a new distributary, would be the most upriver distributary on the Mississippi River and would itself become over time a major element of the river and its hydrology.

Subsidence (Room 253)

Moderator: Angelina Freeman, Environmental Defense Fund

Subsidence Mechanisms and Rates within and beyond Coastal Louisiana: An Overview of Recent Progress

***Torbjörn E. Törnqvist*[1]*,** *Zhixiong Shen*[1]*, Nancye H. Dawers*[1]*, Nicole M. Gasparini*[1]*, Juan L. González*[2]*, Marc P. Hijma*[1]*, Ping Hu*[1]*, Mark A. Kulp*[3]*, Barbara Mauz*[4]*, Glenn A. Milne*[5]*, Martin Wolstencroft*[5]*, Shiyong Yu*[1]

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While it is widely accepted that land-surface subsidence rates as high as ~1 cm/yr constitute a premier driver of rapid rates of relative sea-level (RSL) rise in coastal Louisiana, vigorous debate persists about the underlying mechanisms. Much of this debate has centered on the question whether subsidence is driven primarily by processes deep in the Earth's crust or whether the shallow subsurface is the main culprit. Considerable progress is currently being made towards unraveling this problem by means of a concerted effort based on field studies and modeling that focuses primarily on sediment compaction, glacial isostatic adjustment (GIA), lithospheric flexure due to sediment loading, and faulting. Much of this work is anchored by high-resolution reconstructions of Holocene RSL change along the Louisiana coast, more recently augmented by studies of the deformation of late Pleistocene strata near and beyond the Mississippi Delta.

Comparison of detailed reconstructions of Holocene RSL rise from the Chenier Plain and the Mississippi Delta shows differential crustal motions of Pleistocene and deeper strata of ~0.15 ± 0.07 mm/yr. This difference can be explained by the effect of sediment accumulation in the delta and the resulting depression of the underlying lithosphere. The resulting flexure signal features a distinct peripheral bulge that extends from about 30.5º to 35º N, suggesting an elastic lithospheric thickness underneath the region of at least 50 km. Such evidence is invaluable for geophysical (GIA) model predictions of the response of the solid earth to deltaic sediment loading, as well as spatially explicit predictions of current and future subsidence rates. GIA by means of forebulge collapse associated with the melting of the Laurentide Ice Sheet affects all of coastal Louisiana and operates at a rate of 0.45 mm/yr or slightly less. Finally, an investigation of the Baton Rouge Fault Zone, perhaps the most prominent fault zone in the region that has been singled out as a major driver of regional subsidence, shows averaged fault slip rates of ~0.04 mm/yr over the past 30 to 130 kyr. Thus, conclusive evidence now exists that while deeper crustal processes are geologically significant, they are relatively minor over timescales of human interest. In contrast, compaction of Holocene strata, locally augmented by fluid extraction (both hydrocarbons and groundwater), dominates the rates of RSL rise over the past century and will remain significant concerns in the future.

Implications

Effective management and restoration of Louisiana's coastal zone requires detailed evidence on the causes and rates of subsidence, including its spatial pattern. An increasing body of evidence shows that processes operating deeper in the Earth's crust (e.g., faulting) are sufficiently slow that they pose a minor concern over human timescales. In contrast, processes within the shallow coastal and deltaic deposits (notably sediment compaction) typically account for at least 80% of the subsidence as measured at the land surface. The implications of these findings are manifold. For example, foundations anchored in Pleistocene strata are likely to be comparatively stable whereas any infrastructure (whether new levees or sediment bodies formed from river diversions) that rests on surface sediments will experience considerable subsidence rates. Notwithstanding these findings, climate-driven accelerated sea-level rise is likely to become the primary cause of coastal flooding and wetland loss later in the 21st century.

New Subsidence Curves for Northern Gulf of Mexico Tide Gauges and Their Implications for Coastal Restoration

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It widely recognized that rates of relative sea level rise (RSLR) in Mississippi River Delta (MRD) are among the highest rates on Earth, and that this subsidence plays an important role in the massive wetland loss that has occurred along its coastline. However, there exists considerable disagreement over the magnitude of these rates of subsidence, and how they vary over time over space and time. Here we report a new method of tide gauge analysis, based on an understanding of the dynamical drivers of sea-level change. We demonstrate that the inter-annual variability at the Pensacola, Grand Isle and Galveston tide gauges show a remarkable similarity, and that this similarity is driven by regional meteorological patterns. Thus we could subtract the geologically stable sea Pensacola tide gauge record from the Grand Isle and Galveston tide gauge records, which resulted in a subsidence record for these stations. Results show that rates of subsidence at Grand Isle, LA fit a quasi-parabolic pattern, which start at 3.52 ± 2.79 mm yr^{-1} in the 1947-1952 period, reach their maximum of 15.83 ± 3.06 mm yr^{-1} in the 1965-1970 period and then decline to -1.54 ± 6.20 mm yr^{-1} in the 2001-2006. Temporal patterns in subsidence are closely coupled to temporal patterns of oil and gas withdrawal and rates of wetland loss in south Louisiana.

Implications

These findings suggest that current rates of subsidence at key areas in the MRD may be at the low end of many projections. If these results are upheld across a wider spatial area, it would suggest that restoration of the critical zones in the MRD would be possible, particularly if large quantities of sediments can be trapped in the nearshore zone.

Louisiana Coastal Zone Primary GPS Network Update

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The Louisiana Coastal Zone (LCZ) Primary Global Positioning System (GPS) Network is a collection of geodetic grade benchmarks located along the Louisiana gulf coast from Texas to Mississippi established by the Louisiana Department of Natural Resources. The intent of the LCZ Primary GPS Network is to provide a means of accessing a common horizontal and vertical datum from which a multitude of coastal projects are referenced.

Most coastal projects rely on accurate and consistent elevations for modeling and design. If the elevations from various sources (e.g. terrestrial survey, aerial LiDAR, hydrographic survey) are not referenced to a common horizontal and/or vertical datum, then discrepancies can result.

The primary problem facing the LCZ Primary GPS Network is vertical movement. The vertical movement is a result of crustal motion and subsidence. Vertical movement in coastal Louisiana can range "from less than a millimeter per year to over 10.0 millimeters per year in some locations."

An approach for resolution is a complete update of the LCZ Primary GPS Network using GPS observations and the inclusion of additional Continuously Operating Reference Stations (CORS). The LCZ Primary GPS Network consists of a number of Class A and B deep rod monuments that are considered resistant to surface movement. These monuments are ideal for updating and future monitoring.

The LCZ Primary GPS Network update will result in current geodetic positions and orthometric heights for all benchmarks occupied. These current positions and elevations can then be compared to historical values to analyze regional subsidence. The updated positions can also be used to accurately compared completed coastal projects to current or future projects. The primary result will be an established and continually updated network of benchmarks for the basis of all future coastal projects.

Updating benchmark networks is not a new concept for southern Louisiana. The National Geodetic Survey (NGS) has conducted numerous "Height Modernation" campaigns throughout recent history. The most recent update being performed by NGS, with the aid of sub consultants, is still ongoing while historical campaigns took place in 2004 and 2006. SJB Group, LLC has performed similar projects in East Baton Rouge Parish, Iberville Parish, and Ascension Parish with a project in Livingston Parish currently underway.

Implications

The results of this study will improve the foundation from which all coastal projects are built, elevation. Without an understanding of the dynamic nature of the elevations in coastal Louisiana, future coastal planning and implementation can be adversely affected.

Hydrodynamics (Room 252)

Moderator: Ehab Meselhe

The Water Institute of the Gulf

It's Not Your Father's RMA/TABS Model Anymore

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The RMA2 and RMA4 hydrodynamic and transport models that were originally developed in the 1970's for the US Army Corps of Engineers (Corps) and were released as the TABS system of models enjoyed development by the Corps through the 1990's. However, in recent years the only significant Corps development of the RMA models has been to convert them to run on supercomputers and computer clusters.

The RMA models have been modified most recently outside the Corps by one of the original model developers, Dr. Ian King of Resource Modelling Associates. Enhancements and improvements have been made to the models by Dr. King such that simulations for very large-scale problems (thousands of square miles) for long durations (several years) have become feasible using standalone personal computers for evaluating coastal restoration projects in Louisiana.

This presentation describes the changes that have been made to make the model more applicable to coastal systems and more feasible to run for large systems. Also presented are results from case studies for several such systems in coastal Louisiana.

Implications

The enhancements and improvements to the RMA modeling system make the simulation of more complex and larger systems over longer durations possible in a shorter amount of time using inexpensive personal computers (i.e., instead of supercomputers or computer clusters). This means that it has become a more effective predictive tool for evaluating proposed changes for restoration or protection of coastal systems.

Relative Impact of Highway Construction on Wetland Hydrology in Environmentally Sensitive Areas in Southeast Louisiana

***Jeanne Arceneaux*[1]*,* *Ehab Meselhe*[1]*, Robert Miller*[1]*, Justin Shaw*[1]

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Located along the southeastern coast of Louisiana, St. Tammany Parish has minimal overland slope and is home to a diverse collection of environmentally sensitive areas. An environmental impact statement (EIS) emphasizing wetland hydrology and water circulation patterns was developed to examine potential environmental issues due to the proposed construction of LA-3241 from I-12 to Bush, LA. Several roadway alignments were evaluated using hydrologic and hydraulic numerical models to determine impacts to environmentally sensitive areas. Topography/canopy changes, water level fluctuations, and ponding/drought variations were thoroughly examined to determine the least impactful alternative.

The study area fell within portions of three major watersheds: Bogue Chitto, Liberty Bayou-Tchefuncta, and Lower Pearl. Light Detection and Ranging (LiDAR) data was used to delineate the study area into 19 hydrologic basins totaling 145.3 square miles (93,002 acres). These basins were further delineated into approximately 420 subbasins for each roadway alignment and the existing conditions. Peak discharges were determined for each subbasin and routed through the study area using the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS). The HEC-HMS models were used to estimate stormwater runoff during the 24-hour, 50- and 100-year flood frequency storms and size drainage structures along the proposed roadway alignments.

Roadway alignments that cross channels, swamps, and wetlands may alter natural drainage patterns and disrupt the ecology and hydrology within environmentally sensitive areas. Impacts of the proposed alignments on the natural overland sheet flow and adjacent environmentally sensitive areas were analyzed using MIKE FLOOD developed by the Danish Hydraulic Institute (DHI). MIKE FLOOD provided an integrated one and two-dimensional numerical modeling approach which allowed for assessment of over 380 miles of channel and overland flow within the study area.

A composite, categorical rating system was developed to compare environmental impacts caused by each proposed alignment. The comparison emphasized several factors which greatly influence an alignment's impacts: location within hydrologic basins, length of new roadway, placement of roadway in wetlands, and number of channel crossings. The rating system presented an alignment with the least environmental impacts based on the composite score. The analysis and comparison methodology presented can be applied to other projects in environmentally sensitive areas.

Implications

This study provides a quantitative assessstment of the hydrologic impacts of highway construction in environmentally sensitive areas on a regional scale. Methods presented in this study are valuable for future large-scale projects requiring an environmental analysis. The two-dimensional modeling techniques are applicable to flood and inundation studies throughout coastal Louisiana, and the categorical rating system can be used to characterize wetland impacts based on computer simulated results. This study emphasizes the importance of investigating all possible environmental factors to determine the impacts for proposed projects.

Examining the Teche-Vermilion Fresh Water Diversion Project as a Model for Other Diversion Projects

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Following the great flood of 1927 levees constructed to prevent another similar catastrophe cut off the flow of water from the Atchafalaya River to the Teche-Vermilion basin. It also severed the connection between Lake Fausse Point and the Atchafalaya which reduced flow to the lower Bayou Teche basin. The result was stagnation, pollution, and salt water intrusion at the lower end. The groundwater supply was being threatened by contamination due to lack of flow.

In 1976 construction of the Teche-Vermilion Fresh Water Diversion Project was begun. The project took advantage of several existing structures and built others. The largest part of the project was the construction of a pumping station and channel from the Atchafalaya River to Bayou Courtableau which then empties into Bayou Teche. Bayou Teche was connected to Bayou Vermilion via Bayou Fusilier and the already existing Ruth Canal. The project was completed in 1982 at a cost of $43.7 million.

The Teche-Vermilion project benefits were immediate. Both Bayou Teche and Bayou Vermilion had become terribly polluted. Introducing fresh water brought relief to much of that problem. It also provides good quality water for agriculture, aquaculture, and industry in the watershed. Introducing fresh water helped to rejuvenate the marsh as well. Following hurricane Rita fresh water from the diversion helped the recovery of salt contaminated lands throughout lower Vermilion parish. In addition, the use of surface water supplies helps to reduce the demand on ground water taking some pressure off the Chicot aquifer and others.

The success of this project offers promise to the adoption of similar practices to move more of the confined water from the Atchafalaya and Mississippi Rivers to the southwestern part of the state. For example, one possible route would be from Bayou Courtableau north of Washington to Bayou Bellview between Washington and Opelousas. Bayou Bellview connects to Bayou Plaquemine Brule` which meanders through St. Landry, Acadia and Jefferson Davis parishes eventually emptying into the Mermentau River on the border of Jefferson Davis and Cameron parishes.

The ironic extremely serious drought at a time when potential Mississippi River flooding prompted open the Morganza Floodway for only the second time in its existence accents the need to establish a more natural system of water use and management than currently exists. Indeed, had systems similar to what has been described been in place it might have been possible to avoid opening the flood gates by taking pressure off the rivers.

Implications

Much of the problems associated with land loss along the Louisiana coast have been associated with the absence of fresh water and the consequential intrusion of salt water. Many believe the flood control levees constructed following the flood of 1927 are a major part of the problem. Clearly, flood control is absolutely necessary, however the massive waste of precious water dumping silt laden, nutrient rich water into the Gulf of Mexico deprives the coastal zone of fresh water while simultaneously polluting the Gulf of Mexico.

Fresh water diversion projects offer solutions to both problems.

Concurrent Session VIII
Wednesday, June 27 10:30-12:00

Marsh Vegetation (Room 257)

Moderator: Jenneke Visser
ULL

A 5-Year Mesocosm Study on 11 Species of Wetland Plants Common to Coastal Louisiana: The Effects of Water Quality, Hydrology, Sediment Addition, and Hurricanes on Above- and Belowground Production

Gary P. Shaffer*[1]*, *Eva Hillmann*[1]*, Chris Carrel*[1]*, W. Bernard Wood*[1]*, Edward Koch*[1]*, Lucas Watkins*[1]
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This study utilized a 5-year mesocosm experiment to investigate (1) the reaction of a species-habitat relationship to Hurricane Demetra and (2) the relationships between 11 woody and herbaceous plant species inhabiting 48 habitat combinations common to coastal Louisiana. The ultimate goal of this study was to use this massive factorial design to build a set of assembly rules to be used in implementation of successful management and restoration strategies.

The most biomass produced of all habitat types was in a freshwater river diversion scenario (fresh water with nutrients, throughput hydrology, and sediment addition). *Peltrandra virginica* and *Sagittara lancifolia* were found to be the weakest competitors overall, whereas *Panicum hemitomon* and *Typha domingensis* were the two most dominant species. *P. hemitomon* dominated fresh water with nutrient augmentation while *Typha domingensis* dominated all other habitat types.

The current body of debate in the scientific community (and by default the political community) regarding the restoration of coastal Louisiana includes a discussion on the impact of nutrients on the production of belowground biomass. Some research indicates that belowground biomass may decrease with nutrient enrichment. This may subject the receiving wetlands of freshwater diversions and wastewater effluent to increased erosion and wind throw, which could hinder storm buffering benefits. Our mesocosm experiment allowed us to investigate the effects of nutrient loading on the (a) above- and belowground biomass production of wetland plants, (b) depth of root foraging activity, (c) overall effect on root to shoot ratio (R:S) and (d) soil elevation. The water quality component of the factorial design consisted of four treatment levels: fresh water, fresh water with nutrients (90 g N m^{-2} yr^{-1}), 3 ppt salinity and 6 ppt salinity. These were crossed with three types of wetland hydrology (mesic, permanently flooded and constant throughput), sediment addition (yes, no) and a simulated hurricane (yes, no). After 5 years of growth, root to shoot ratio decreased (F=16.92, p<0.001), even though belowground biomass doubled (F=24.79, p<0.001) with nutrient additions. Moreover, absolute amount of belowground biomass increased in deeper soil sections (>30 cm) over the other water quality treatments (F=16.44, p<0.001). Soil elevation was positively related to the amount of belowground biomass (R^2=.34, p<0.001). Further, only nutrient treated mesocosm vessels produced enough root material to more than offset soil subsidence of 5mm/year (F=32.48,p<0.001).

Implications

This study utilized a 5-year mesocosm experiment to investigate (1) the reaction of a species-habitat relationship to a major storm event, (2) the relationships between 11 woody and herbaceous plant species inhabiting 48 habitat combinations common to coastal Louisiana, and (3) the belowground response of the 11 species to nutrient loading. The ultimate goal of this study was to use this massive factorial design to build a set of assembly rules to be used in implementation of successful management and restoration strategies. The results of these experiments should be used to promote beneficial use of river diversions and treated wastewater to restore the wetlands of coastal Louisiana.

Using Artificial Neural Networks to Develop an Emergent Marsh Vegetation Community Classification System in Louisiana Coastal Wetlands: Application of Self-Organizing Maps (SOMs)

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Though a diverse array of linear ordination and clustering methods have been used for decades to classify ecological communities, their utility is somewhat limiting for datasets that are strongly non-linear and contain numerous outliers and missing data points, all of which are typical traits for species abundance datasets that are obtained across diverse landscapes. The self-organizing map (SOM), which provides a topology-preserving non-linear projection of multivariate data onto a 2-dimensional space (map), is a relatively new artificial neural network approach that is very robust to these limitations. Each unit in the map represents a unique “virtual” community assemblage, and neighboring units share similar assemblages. Another key distinction from traditional multivariate analysis techniques that makes SOMs very effective at tracking trajectories of ecological communities through time is that once an SOM is trained with a large dataset, new samples can be projected onto the trained SOM network without altering the established ordination. This trait makes SOMs an ideal approach to developing community classification algorithms based on in situ vegetation community composition data. In this study, an SOM is trained from vegetation species cover data obtained at nearly 4000 marsh sites across coastal Louisiana in late summer 2007. Subdividing the trained SOM into regions that signify distinct community types is accomplished by submitting the species weight vectors of each map unit of the SOM to cluster analysis. Species cover samples obtained from the Coastwide Reference Monitoring System (CRMS) and Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) monitoring are then projected onto the SOM to examine how temporal variability in community composition may respond to restoration activities, climate variability and disturbance.

Implications

Vegetation community composition is often chosen as the basis for the classification of wetland ecosystems because it can reflect the integration of multiple ecological processes acting on site or landscape scale more effectively than any other factor or set of factors. Patterns of co-occurring plant species can be used to infer spatial and temporal gradients in salinity, inundation and disturbance regimes. Thus, classifying communities in coastal wetlands based on vegetation can serve to describe many aspects of ecology across coastal landscapes, and to track the trajectory of those landscapes through time. While established methods exist for classifying existing samples, they are unstable to the addition of new data. Utilizing SOMs provides a means to develop a stable classification system that can be applied to existing data as well as new samples as they become available to track how future trajectories of coastal communities respond to restoration activities and environmental disturbance.

Environmental Constraints on the Establishment and Expansion of Three Species of Freshwater Tidal Marsh Macrophytes *(Schoenoplectus acutus, S. californicus and Typha latifolia)*: Implications for Restoration

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Understanding factors that influence plant species establishment and zonation patterns in restored wetlands remain an area of research need. This study evaluated the effects of edaphic and hydrologic conditions on vegetation establishment and expansion in a developing tidal freshwater wetland restoration site in California. The Sacramento-San Joaquin Bay Delta in California is recognized for its role in providing important ecological services; however, historical manipulation via levee construction of these fertile deltaic sediments for agriculture has resulted in vast losses of wetland habitat. The associated loss of wetland ecosystem services has given impetus to assessing the potential of intentional breaching of these levees to re-introduce hydrologic connectivity and restore the land to tidal freshwater wetlands. The levees surrounding Liberty Island, CA, were breached in 1997, making this site an ideal setting to assess constraints on wetland plant establishment and species interactions. Using four transplant sites that varied in proximity to previously colonized marsh shorelines and extent of adjacent open water, we examined the effects of these varying environmental conditions on the establishment and expansion of three tidal marsh macrophytes: (*Schoenoplectus acutus, Schoenoplectus californicus* and *Typha latifolia*) at two life history stages (rhizome and adult). Two of these species, *S. californicus* and *T. latifolia* occur in Louisiana, and there is interest in increasing the utilization of *S. californicus* on wetland restoration projects. Environmental characterization elucidated that soil bulk density is positively correlated with distance from the existing colonized marsh shorelines and negatively correlated with extent of open water. Preliminary results indicate variation in species survival as *S. californicus* has established more successfully than the other species and expanded to more than an order of magnitude greater (in terms of area colonized) than the other two species. Furthermore, degree and depth of the compacted soil layers may be differentially influencing species survival and expansion. Total area of expansion of all species was more than 2.5 times greater in areas of lesser compacted soils. A subsequent controlled experiment was conducted in Louisiana to investigate the effects of two stages of soil compaction (loosely and highly compacted) on edaphic conditions and plant morphology and physiology of the same species used in the field experiment. The study found that soil became more reduced under higher compaction. Also significant differences existed between species and compaction treatments regarding plant survival and growth responses, indicating that degree of soil compaction may be limiting to plant survival and growth.

Implications

The information gained from this study will aid restoration planning by optimizing plant species selections and placement of plantings to maximize efficiency, meet restoration goals and further refine restoration trajectories for the Delta. Furthermore, this project has elucidated potential threats to the success of re-establishing vegetation in a historically modified wetland ecosystem. Although the field research portion of this study was conducted in California, two of the species investigated occur in Louisiana, and the results of this research are applicable to a variety of regions where achieving a better understanding of the modulating effects of environmental factors on species establishment and zonation can enhance the success of wetland restoration and creation projects.

Productivity and Habitat (Room 255)

Moderator: Seth Blitch
The Nature Conservancy

A Spatially-Explicit Individual-Based Model of a Northern Gulf of Mexico Tidal Marsh Community: Applications for Evaluating Population-Level Responses from Individual-Level Effects

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A spatially-explicit individual-based model (IBM) of a tidal marsh nekton community has been developed to examine how effects from multiple factors (i.e., hypoxia, habitat degradation, salinity, stressors) on individuals can be scaled to population and community responses. The IBM simulates the daily dynamics for six species over one year as they feed, grow, survive, reproduce, and move about a marsh grid of water and vegetated cells generally configured to represent a low-elevation coastal *Spartina* marsh in the northern Gulf of Mexico. Individual consumption, mortality, and movement are updated hourly, while individual growth and spawning are evaluated daily. The six species in the IBM are: grass shrimp (*Palaemonetes pugio*), inland silverside (*Menidia berrylina*), bay anchovy (*Anchoa mitchilli*), sheepshead minnow (Cyprinidon variegatus), gulf killifish (*Fundulus grandis*), and blue crab (*Callinectes sapidus*). Grass shrimp, inland silverside, sheepshead minnow, and gulf killifish are resident species that spend their entire life cycle within the tidal marsh. Bay anchovy and blue crab are transient species that enter the tidal marsh as feeding larvae and megalopae and leave when they reach maturation size.

The 2-dimensional tidal marsh grid is comprised of 10,000 cells (100x100), with each cell representing a 4-m^2 area. Each cell is classified as one of five habitat types: channel, creek, marsh edge, marsh interior, or pond. Channel cells are deeper water cells connecting the marsh grid to open water. Creek cells are water cells representing shallower tidal creeks that weave the marsh. Edge cells are marsh vegetation cells that share a side or corner with a water cell. Marsh interior cells are vegetation cells separated from water cells by at least two meters (i.e., one edge cell). Pond cells are water cells within the marsh interior. Whether a particular cell is inundated with water, and therefore accessible to individuals for movement and feeding, depends on the elevation of the habitat cell and hourly water levels simulated across the marsh grid. Temperature, salinity, dissolved oxygen (DO), and prey concentration (zooplankton and benthos) vary hourly within each habitat cell. Stressors (e.g., toxicant concentration) vary daily within habitat cells, and can be applied either uniformly or localized across the grid.

The IBM allows for the examination of multiple effects on interacting species (e.g., competition or predator-prey) residing within a complex tidal marsh habitat. The IBM incorporates individual variation in size and movement of the species that affects their feeding, mortality, and habitat use within the tidal marsh. Individual-level effects to environmental conditions and stressors measured in the laboratory or field are applied as functional responses in the model, and then scaled up over all individuals to evaluate potential population and community responses in the marsh.

Implications

The IBM is used for examination of multiple effects on interacting species (e.g., competition or predator-prey) residing within a complex tidal marsh habitat. The IBM incorporates individual variation in size and movement of the species, and fine-scale differences in habitat, which affects the feeding, mortality, and habitat use of the species within the tidal marsh. Individual-level effects to environmental conditions and stressors measured in the laboratory or field are applied as functional responses in the IBM and then scaled up over all individuals in order to evaluate the potential population and community responses within the marsh. The IBM allows for multiple stressor effects on individuals to be expressed at the population and community levels.

Assessing Optimal Salinity Levels for Nekton Assemblages in the Lower Barataria Estuary

J. Brian Alford[1]
[1] Louisiana Department of Wildlife and Fisheries, Fisheries Management Section, 2000 Quail Dr., Baton Rouge, LA 70808

Freshwater diversions of the Mississippi River are part of the restoration strategy employed by the state of Louisiana and the U.S. Army Corps of Engineers (USACE) to offset saltwater intrusion and coastal erosion. In the Barataria Basin, a new diversion structure has been proposed at Myrtle Grove. It is hypothesized that environmental changes brought about by freshwater will alter the amount of suitable habitat for estuarine fish and shellfish (i.e., nekton), for example, by changing salinity and water temperature regimes, and/or physical habitat. I used multivariate, direct gradient analysis and generalized additive models (GAM) to evaluate the potential impact of the proposed Myrtle Grove diversion on nekton community structure in the lower Barataria estuary. I used species catch and associated physicochemical data collected by the Louisiana Department of Wildlife and Fisheries (LDWF) as part of their fishery-independent monitoring program. Fish and physicochemical data were collected with otter trawls, seines and gill nets were at 9-12 fixed stations on monthly-bimonthly occasions during April-July 1991-2011. I used canonical correspondence analysis (CCA) to determine the impact of salinity on nekton community structure, and GAMs (assuming a Poisson error distribution) to predict the salinity levels that will optimize species abundances in the lower Barataria estuary. The CCA axis 1 scores represented a gradient of community structure constrained by salinity, and were used as the predictor variable in the GAMs. I also used GAMs to predict actual salinity levels that would optimize individual species abundances. There tended to be a greater number of predators and benthic invertivores that showed a positive relationship with salinity (CCA, T-value biplots, P≤0.05), compared to those that showed a negative relationship, indicating a slight trophic shift in the community towards omnivores and planktivores as salinity decreases. Optimal salinity ranges for some economically important fishery species were ≥11 ppt for adult Spotted seatrout (gill net), 6 and 11 ppt for Brown shrimp (seine and trawl, respectively), 2-6 ppt for juvenile Gulf menhaden (seine and trawl), ≥18 ppt for adult Gulf menhaden (gill net), 2-6 ppt for White shrimp and Atlantic croaker (trawl), <1-6 for Red drum and Black drum (gill net), and ≥32 ppt for juvenile Striped mullet and White mullet (seine). Blue crab optimal salinity was <1 ppt from seine and trawl gear, but ≥32 ppt for the gill net gear, perhaps reflecting migratory differences between sexes. Atlantic bumper, Southern kingfish and Florida pompano were optimal at ≥32 ppt for all gear types. Shannon-Wiener diversity indices and richness tended to be optimized at moderate salinities (5-20 ppt), with the exception of richness from seine and gill net samples (35 ppt), likely as a result from rare, transient marine species entering the estuary.

Implications

This research will provide a decision support tool for assessing the impact of variety operating regimes at the proposed Myrtle Grove diversion. Given salinity regime predictions from hydrological and hydrodynamic models, structural changes in the nekton community (e.g., species compositions, abundance shifts) can be projected. Information from this study could be used to develop habitat suitability models required for environmental impact assessments needed for Corps diversion projects.

An Oyster Habitat Suitability Index Model and its Application to Coastal Restoration in Louisiana

Thomas M. Soniat[1]
[1] University of New Orleans, New Orleans, LA 70148

An Oyster Habitat Suitability Index (HSI) Model was constructed as part of the analytical tools used to inform the 2012 Coastal Master Plan. The model is used to evaluate changes in oyster habitat suitability over 50 years given changes that may occur due to the construction of restoration projects. The over-arching assumption of the HSI is that oyster habitat quality can be modeled as suitable salinity over suitable substrate. Suitable salinity was resolved into three salinity-based variables, which treat different aspects of the oyster's dependency on salinity. A higher optimal salinity for spawning than for survival of adults is described as mean salinity during the spawning season, an annual mean salinity which designates an expected range over which oysters exist as well as an optimum range over which they thrive, and a minimum annual salinity which defines the impacts of killing floods. Suitable cultch is expressed as the percentage of the bottom covered with hard substrate (e.g., oyster shell). A value for each variable is assigned a corresponding dimensionless Suitability Index (SI) value which varies from 0 (unsuitable) to 1.0 (optimal). Oyster HSI, which likewise varies from 0 (unsuitable habitat) to 1.0 (optimal habitat), is calculated as a geometric mean of the SI values; thus, if any component SI is 0, HSI is 0.

Implications

The oyster HSI model was used to evaluate project effects on habitat suitability for oysters in support of Louisiana's 2012 Coastal Master Plan. This is a broad, planning level model that when connected with the suite of other models used in this effort supports systems-level planning modeling. This model is applicable to any restoration project that alters salinity (e.g., river diversion) or modifies substrate (e.g., land building). The entire suite of models builds upon previous coastal planning models (e.g., LCA 2004 and CLEAR 2007). The models developed for the 2012 Coastal Master Plan form a robust suite of tools that can be used for future coastal planning efforts.

Relative Sea-Level Rise I (Room 253)

Moderator: Jim Pahl
CPRA

Sea Level Rise and Tidal Impacts

Jay Ratcliff[1]***,*** *Jane Smith*[1]
[1] US Army Engineer & Research Development Center, 7400 Leake Avenue, New Orleans, LA 70118

Sea Level Rise (SLR) directly impacts the entire Louisiana coastal zone and is a key driving force of wetland loss and habitat transitions. Historic sea levels as well as future projections compute rates of mean sea level change and are normally portrayed using x-y rate curves. Often these do not convey the full threat of potential impacts. This effort analyzes the total spatial and temporal range of tidal affects for specific sea level rise projections. The CRA as well as the USACE are mandated to address direct and indirect physical effects of projected future sea level change across the project life cycle. The CRA Master Plan addresses three scenarios (moderate and less optimistic) and the USACE analyze three rates following EC 1165-2-212 guidance. EC 1165-2-212 provides procedures and methodology to consider alternatives that that are formulated and evaluated for three scenarios of "low", "intermediate", and "high" sea-level change. Alternatives are evaluated for each scenario for both "with" and "without" project conditions. "Intermediate" and "high" rates are estimated using modified National Research Council (NRC) curves and EC 1165-2-212 equations.

The values computed for each SLR scenario are mean sea level values. The mean value alone does not provide enough information to understand and determine the level of impacts and potential damages to projects. Tide water levels can be diurnal or semi-diurnal and have a range of elevations from Mean Higher High Water (MHHW) through Mean Lower Low Water (MLLW) which form the Great Tide Range (GTR) (Louisiana coast has a GT Diurnal Tide Range). High water levels induced by storm tides are also critical and cause significant damages. Tidal ranges have significant impacts on wetlands determining the frequency of inundation and concentration of salinity to marshes and other wetland vegetation.

Future SLR scenario tidal ranges are estimated at three specific stations in a three step methodology. These steps are (a) De-trend tide gage records, (b) Develop future sea level rise scenarios, and (c) Add de-trended tide gage fluctuations to future sea level trends. These results provide a total view of the range of water levels given a mean sea level (MSL) estimated for a specific sea level rise scenario. Projections are analyzed at three stations pertinent to the region of the Chenier Plains, central Louisiana, and east of the Mississippi River.

In order to ascertain influence and limits of tidal ranges across the region, ADCIRC numerical model simulations are performed using the most recent, high resolution Louisiana mesh. Existing and future inland extents of tidal influence and inundation are created from ADCIRC tidal simulations.

Implications

Sea level rise has profound effects on the future of Louisiana coasts. Uncertainty in the projections is addressed by analyses of plausible future scenarios. Projections compute mean sea level but the total range of water levels as well as frequency of inundation has direct impacts to coastal ecosystems. Future water level ranges and durations affect wetlands habitats and Wetland Value Assessments (WVA) and Habitat Units computations into economic and ecosystem evaluation processes. These factors should be addressed in all future coastal restoration and protection planning efforts. Combining the total range of SLR with other components such as subsidence, storms, river discharges, marsh collapse, etc. will provide a more complete assessment of climate change threats.

Recommendations for Anticipating Sea-Level Rise Impacts on Louisiana Coastal Resources During Project Planning and Design

Kristin E. DeMarco, *James W. Pahl, Jennifer Mouton*[1]

[1] Coastal Protection and Restoration Authority,Louisiana Applied Coastal Engineering and Science (LACES) Division, 450 Laurel St. Suite 1501, Baton Rouge, LA 70801

Louisiana is particularly sensitive to sea-level rise (SLR) due to the distinctive geology and inherent nature of the Mississippi River Delta. An in depth evaluation of the science has been completed by the LACES staff and has resulted in a recommendation for the most likely future increase in global MSL of 1 meter by 2100. Additionally, LACES recommends that any SLR modeling scenarios models for state restoration projects assume a 1-meter (3.3') MSL rise by 2100 compared to the late 1980s and should be bracketed by GSLR ranges of 0.5-1.5 meters (1.4'-4.9') by 2100. For management, LACES has also prepared a step-by-step process for incorporating these sea level rise recommendations into the planning and design of coastal restoration and protection projects.

In general, to process for determining and incorporating sea level rise is described in the equation below:

$$E(t) = (a*t + b*t^2) + S*t$$

where E is RSLR over the time increment t,
a is the historical linear rate of GSLR,
b is the acceleration constant for predicted GSLR, and
S is rate of subsidence.

To apply this equation to a specific project, apply the values to the variables as described below:

1. Use local observations of sea-level rise from contemporary satellite altimetry just offshore of coastal Louisiana. This is the rate of SLR

(mm/yr.) and variable (a) from the generalized equation.

2. Calculate the acceleration constant (b) that assumes a MSL increase of 1 meter (3.3’) by 2100 as the most heavily-weighted project alternative, while also testing MSL increases of 0.5 meters (1.6’) and 1.5 meters (4.9’) to account for uncertainty in the literature.

This provides the change in water levels over time at a project location. To localize further,

3. Add in local subsidence values obtained from the most proximate local source, which is variable (S) in Equation 7.

In order to predict the persistence the coastal wetland, and specifically the persistence of the wetland surface or conversely marsh surface collapse, a fourth step is necessary.

4. Use the sum of #s 1-3 above to establish an inundation function in order to predict local responses of marsh vertical accretion. This can be inferred from scientific literature if no reliable data exist on site, or can be estimated from vegetation productivity models if available.

A step-by-step walkthrough of the application of this process will be demonstrated using an actual restoration project (case study) currently under design by CPRA. The process and associated tools developed by LACES to assist coastal planners and engineers will be included in the case study.

Implications

Any effort to confidently incorporate potential SLR impacts on coastal wetlands into planning must account for the sum of factors influencing RSLR: 1) the change in the surface elevation of the Gulf of Mexico, which is the primary topic of this document; 2) local land surface elevation change, which in Louisiana is exclusively represented as subsidence; and 3) marsh vertical accretion, which can offset some SLR impacts. LACES has developed this multi-step process to provide those designing coastal restoration and protection projects with the tools needed in order to design their projects. Utilizing this method will help managers, planners and engineers working in coastal areas to incorporate sea level rise into their project design. Applying this process to settlement rates curves will ensure that constructed marshes will be sustainable for the intended project lifespan and beyond.

Incorporating Sea-Level Rise Projections into Restoration Project Planning and Design

Jennifer Mouton[1], *Travis Byland[2],* Kristin E. DeMarco, James W. Pahl

[1] Applied Research and Development Section, Louisiana Applied Coastal Engineering and Science (LACES) Division, Coastal Protection and Restoration Authority

[2] Restoration Engineering Division, Coastal Protection and Restoration Authority

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To apply this equation to a specific project, apply the values to the variables as described below:

1. Use local observations of sea-level rise from contemporary satellite altimetry just offshore of coastal Louisiana. This is the rate of SLR (mm/yr.) and variable (a) from the generalized equation.

2. Calculate the acceleration constant (b) that assumes a MSL increase of 1 meter (3.3’) by 2100 as the most heavily-weighted project alternative, while also testing MSL increases of 0.5 meters (1.6’) and 1.5 meters (4.9’) to account for uncertainty in the literature.

This provides the change in water levels over time at a project location. To localize further,

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Innovative Restoration Approaches (Room 252)

Moderator: Rick Raynie
CPRA

LaBranche Wetlands Restoration: Implementing Multiple Lines of Defense

Paul Tschirky[1], *Chris Williams[1], Jonathan Hird[1], Steve Wilson[2]*

[1] Moffatt & Nichol, One American Place, 301 Main Street, Suite 800, Baton Rouge LA 70825

[2] Pontchartrain Levee District

Northern St. Charles Parish relies on the hurricane protection levee fronted by the LaBranche Wetlands to provide vital protection from storm surge. Hurricane protection is enhanced through the multiple lines of defense with the Lake Pontchartrain shoreline, the LaBranche Wetlands, and the St. Charles Parish Hurricane Protection Levee forming an integrated system. If one of these elements is lost, the others are more susceptible to the ravages of storms.

Over the last 60 years the Lake Pontchartrain shoreline, which forms the northern boundary of the wetlands, has eroded significantly at an average rate of some 12-15 feet per year. The region of shoreline protected by rock in the late 1980s and early 1990s has remained stable. The shoreline represents the first line of defense for the wetlands from the waves of Lake Pontchartrain. Current efforts include the design of shoreline protection and enhancement for the unprotected reaches along St. Charles Parish. An approximately 2,000 foot segment just east of Bayou LaBranche has been permitted and will be protected by an offshore sill allowing vegetation to grow behind providing enhancement as well as erosion protection.

The wetlands themselves have been subject to the all too typical stresses experienced by wetlands of coastal Louisiana of increased salinity and lost sediment. The wetland has deteriorated severely over the last 75 years. From 1932 to 2005 more than 6,500 acres of wetland loss have occurred with large areas becoming open water. This loss has been driven by increases in salinity, subsidence, lack of sediment supply, hurricanes, canal construction and channelization and shoreline erosion and breaching. In addition to providing buffering against storm surge and waves that would otherwise impact the levee directly, the wetlands provide essential habitat for numerous species of flora and fauna ranging from bald cypress trees and marsh plants to fish, ducks, and bald eagles.

A hydrodynamic model of the entire LaBranche Wetlands has been developed and calibrated to six months of water level, salinity, and flow data collected in 2010. The model is serving as a vital tool in the planning for the hydrologic and environmental restoration of the entire LaBranche wetlands. Specifically, the plan will:

1. Recommend the project features required to restore and sustain a fresher water salinity regime in the LBW more similar to historical conditions.
2. Recommend the "what-when-where-how-how much" details of freshwater / sediment / nutrients re-introduction into the LaBranche Wetlands.
3. Propose water control structures to optimize freshwater retention and minimize saltwater intrusion.

This presentation will discuss the results of these modeling, planning, and design efforts. Success will require protecting the shoreline, which allows for restoring and maintaining the wetland, and in turn provides protection to the levees.

Implications

The restoration of the LaBranche Wetlands and the adjacent protection of the Lake Pontchartrain shoreline together with the St. Charles Parish Hurricane Protection Levee represent an integrated, multiple lines of defense approach to hopefully serve as a blueprint for similar efforts. Restoration and protection working together in the rapidly deteriorating landscape of coastal Louisiana are critical in producing sustainable solutions. Sustainable approaches recognize the interconnection between parts and functional storm protection as well as the habitat benefits. The LaBranche Wetlands represent a significant Louisiana wetland, which are highly visible adjacent to the New Orleans airport and passed through daily by thousands traveling along I-10. Restoration of these wetlands and better understanding of the hydrodynamics and salinity patterns within them will hopefully have broader implications to the benefit of others restoration projects and public appreciation of the importance of taking sustainable multiple and integrated approaches to storm protection and coastal resilience.

Canal Backfilling at the Barataria Preserve Unit, Jean Lafitte National Historical Park and Preserve, Louisiana

***Haigler "Dusty" Pate*[1]*,* *Julie L. Whitbeck*[1]

[1] *National Park Service, 419 Decatur Street, New Orleans, LA 70130*

The National Park Service has backfilled approximately 5.4 miles of canals using existing spoilbank material in the Barataria Preserve, a unit of Jean Lafitte National Historical Park and Preserve. The goal of this effort is to restore the coastal wetland landscape, and its ecological function, to more natural condition with less disruption from manmade canals. Spoilbanks are the linear piles of soil and sediment created as canals were dredged, and backfilling simply returns this material to the canals. The backfilled canals are allowed to revert to marsh, swamp, and shallow water habitat by natural processes. No further manipulation is required. Benefits of backfilling include improvements to hydrology and sediment, nutrient, and aquatic species movement, restored wetlands, elimination of habitat for invasive exotic woody species, as well as enhanced ecosystem resilience in the face of subsidence and climate change impacts.

The unique wetlands landscape at the 23,000-acre Barataria Preserve contains the only estuarine floating marsh in the National Park System, along with cypress-tupelo swamps, and bottomland hardwood forests. Preserve ecosystems are a significant part of the Barataria-Terrebonne National Estuary, and they buffer more than 20 miles of the federal levee system providing protection to Greater New Orleans.

Restoring more natural hydrology is a major goal outlined in park planning documentation as well as Louisiana Coastwide planning documents. Canals are widely recognized as a major cause of wetland loss, not just because of the direct conversion of land to open water caused by dredging, but because of the chronic effects of fundamentally altered hydrology. However, out of approximately 10,000 miles of canals coastwide in Louisiana, only about 15 miles have been backfilled for the purpose of restoration including the 5.4 miles in the Barataria Preserve. The National Park Service and Jean Lafitte National Park and Preserve are working to demonstrate the effectiveness of canal backfilling as a viable, relatively inexpensive way to restore more natural hydrology and wetlands. We hope that our example leads to greater application of the technique along a seriously threatened coastline.

Implications

Our experience indicates that canal backfilling is an effective, technically simple, relatively low-cost method of wetland restoration and enhancement. Restoring and enhancing wetlands at the Barataria Preserve improves the quality of ecosystem services provided by wetlands buffering a portion of the levee system protecting Greater New Orleans. Backfilling by the National Park Service provides a precedent informing potential conflicts between surface right holders and owners of mineral servitudes.

Innovative Coastal Restoration Tool Using Airplane and Airboat for Rapid Stabilization of Newly Created Marshes

Herry Utomo*[1]*, *Ida Wenefrida*[1]*, Michael Materne*[2]*, and Steve Linscombe*[1]

[1] *Rice Research Station, LSU AgCenter, 1373 Caffey Road, Rayne, LA 70578*

[2] *School of Plant, Environmental, and Soil Sciences, LSU AgCenter*

Innovative coastal restoration tools are crucial to support successful habitat restorations by increasing the success rate, reducing the cost, and increasing the speed, scope, and size of restoration projects. Aerial planting using a fixed-wing airplane or airboat can be integrated into marsh creation projects and help rapid stabilization of newly constructed land. Direct planting of smooth cordgrass (*Spartina alterniflora*) has shown that healthy and mature vegetation can be produced in a single season. Thousands of acres of newly marsh created annually through various programs such as the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Program and state-funded projects, such as the Clean Water Act Compensatory Mitigation Program and the U.S. Army Corps of Engineers' Beneficial Use of Dredged Material Program. The aerial seeding can provide significant economic and environmental benefits as dredged sediments are increasingly used in current coastal restoration efforts to reclaim large areas of land loss.

Extensive aerial planting experiments have been conducted using a fixed-wing airplane in a Bayou DuPont marsh-creation site near Belle Chase, LA, and a Marsh Island Refuge on the coast of Iberia Parish, LA. An airboat was used at a Lake Pontchartrain site within the Big Branch Marsh National Wildlife Refuge near Lacombe, LA. The aerial seeding on the Bayou DuPont site had a limited success due to a rapid dewatering process that caused the majority of the site to remain dry. Direct seeding using an airboat in bare soil in the Lake Pontchartrain site, however, produced excellent vegetation composed of very dense smooth cordgrass plants with 11 stems per square foot in less than five months. The cordgrass population reached maturity in mid-November 2010. On April 25, 2011, aerial seeding was conducted using a commercial fixed-wing airplane over 10 acres of newly constructed marsh at the Marsh Island Refuge on the coast of Iberia Parish. Following the aerial seeding, Marsh Island and the adjacent coastal regions experienced an unusually long period without rain. Healthy and robust smooth cordgrass grew despite the problem. By the end of September 2011, the overall seeded area was covered by mature smooth cordgrass plants. Dense smooth cordgrass populations grew in some areas; however, sparse vegetation was also evident, depending on soil elevation relative to water levels and movement. In mid-November, they produced seed. The cordgrass population exhibited high genetic variation, which included plant type, stem color, plant height, leaf stature, leaf size, leaf color, panicle length, panicle size and heading date. The diversity observed correlates well with the DNA fingerprinting data that were used as one of the important criteria in developing high-seed-producing PolyC15 experimental lines used in this project.

Rapid formation of vegetation cover is very important to protect newly constructed marshes. Since aerial planting only requires very minimum labor involvement on the ground, the seed can be delivered aerially at the end of dredging operations as soon as the fluidity and strength of deposited soils can adequately support the biomass of the growing plants. In addition, establishment of invasive species can also be prevented by this rapid revegetation.

Implications

This topic could impact the future of coastal restoration and protection planning and implementation because of its significant economic and environmental benefits. This technique can be used to rapidly stabilize newly constructed marshes and combined with other restoration as needed to promote diversity capable of supporting abundant wildlife.

Keynote Speaker

Wednesday, June 27 12:00-1:30

Dr. Susanne Moser

Director and Principal Researcher, Susanne Moser Research & Consulting

Susanne Moser, Ph.D., is Director and Principal Researcher of Susanne Moser Research & Consulting in Santa Cruz, California. She is also a Social Science Research Fellow at the Woods Institute for the Environment at Stanford University and a Research Associate at the University of California-Santa Cruz Institute for Marine Sciences. Previously, she served as a Research Scientist at the National Center for Atmospheric Research in Boulder, Colorado; served as staff scientist for climate change at the Union of Concerned Scientists; was a research fellow at Harvard's Kennedy School of Government and at the Heinz Center in Washington, DC.

Moser's work focuses on adaptation to climate change, vulnerability, resilience, climate change communication, social change, decision support and the interaction between scientists, policy-makers and the public. She is a geographer by training (Ph.D. 1997, Clark University) with an interest in how social science can inform society's responses to this global challenge. She has worked in coastal areas, urban and rural communities, with forest-reliant communities, and on human health issues.

Susi contributed to Working Group II of the Nobel prize-winning Intergovernmental Panel on Climate Change's Fourth Assessment Report, and currently serves as Review Editor on the IPCC's Special Report on "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation." She has advised the Obama Administration on communication of climate change, evaluated former Vice President Al Gore's Climate Project on climate change communication, and is a frequent advisor to policy-makers and managers at all levels of government.

Plenary Session II

Wednesday, June 27 1:30-3:00

"A Sum Greater Than its Parts: Coordinating Restoration Interests in Louisiana"

For more than three decades coastal protection and restoration efforts in Louisiana have advanced through a patchwork maze of programs and partners. Even though Louisiana's 2012 Coastal Master Plan has taken significant steps to evaluate, select, prioritize and implement a comprehensive list of projects, a huge challenge remains to coordinate and leverage the number of federal, private or non-governmental resources that have the capacity to contribute to restoration and protection efforts. This plenary session will focus on a discussion of the roles and responsibilities of local, state, federal, and private entities and what is needed to unify or coordinate those efforts toward a collective purpose or a larger shared objective. This discussion will center on perspectives from federal, state and local government as well as private industry.

Panel Moderator:

Dr. Denise Reed
The Water Institute of the Gulf

Panel Participants:

Garret Graves
Chair, Coastal Protection and Restoration Authority

Ken Kopocis
Nominee, Assistant Adminstrator, Office of Water for EPA

Hon. Randy Roach
Mayor of Lake Charles

David Richard
Executive Vice President Stream Properties

Concurrent Session IX

Wednesday, June 27 3:30-5:00

Deep Water Horizon Spill Studies (Room 257)

Moderator: Jason Shackelford
John Chance Landy Surveys

Monitoring of the Louisiana Emergency Berm Project

***Gordon Thomson*[1], *Andrew Wycklendt*[1], *and Whitney Thompson*[1]**
[1] *Coastal Planning & Engineering (A Shaw Group Company) 2481 NW Boca Raton Blvd.,Boca Raton, FL 33431*

In response to the Deepwater Horizon Oil spill on April 20, 2010, the State of Louisiana constructed sand berms along several sections of the state's barrier islands. Constructed reaches include Shell Island (Reach W8), Pelican Island (Reach W9), Scofield Island (Reach W10), and the Chandeleur Islands (Reach E4). This project placed approximately 6,650,000 cubic yards of material along 16.1 miles of barrier island shoreline. The berms were constructed with a crest elevation of +6 feet, NAVD and a crest width of 20 feet. This project increased the elevation of the existing dunes, plugged breaches, and restored a continuous sandy shoreline along the constructed reaches.

The emergency permit requirements and special conditions required that monitoring surveys be conducted immediately after construction as well as at 30, 90, 180, and 360 days following construction. These surveys extend from a location approximately 1,000 feet landward of the berm to the -20 foot (NAVD) contour seaward of the constructed berm. Survey lines were spaced approximately 500 feet apart. Approximately 185 profile line miles were surveyed during each monitoring event.

This is the first time that a complete set of profile data has been collected at such a short time interval immediately following fill placement in Louisiana. The State is utilizing this opportunity to describe the performance of the emergency berms and increase the understanding of coastal processes immediately following fill placement. Initial performance metrics included shoreline and volumetric changes.

Data collection is ongoing with the 360-day survey underway at this time. Analysis of the 30, 90 and 180-day monitoring data is also underway with the initial analysis for Pelican Island already complete. The analysis will be updated to include the 360-day analysis for presentation at the conference.

Initial analysis of the Pelican Island data suggests that the shorelines have been relatively stable except at the ends of the fill areas, where higher losses are expected. Standard volume calculation methodologies are inadequate to describe the variety of coastal processes occurring. Therefore, the measured volume changes were decomposed to better understand post-fill placement processes and more accurately describe the performance of the berm. Processes analyzed include settlement, overwash, offshore loss, and longshore transport. It was determined that over 80% of the fill volume remained within the Pelican Island project area as of the 180-day monitoring event. The analysis suggests that approximately 53% of the volumetric loss was attributed to settlement of the berms, likely due to compaction of the underlying soils. The rate of settlement loss was slowing as would be expected for compaction of underlying soils. This is a significant finding because most barrier island designs did not attribute this amount of loss to subsidence. A sediment budget was developed that shows longshore losses in the order of 20,000 to 50,000 cubic yards/year off the ends of the islands, though sediment transport in the center of the island was typically less than 10,000 cubic yards/year.

The presentation will focus on how the data was analyzed to identify the various coastal processes and extract data necessary to develop a sediment budget for each reach of the constructed berm.

Implications

Many of the barrier island designs (specifically the beach fill section) have been constructed at +6 feet, NAVD for environmental reasons. However, the preliminary analysis is suggesting that the effect of compaction of the underlying soils is greater than previously estimated. This analysis provides greater insight into magnitude of the compaction and impact on the elevation of the barrier island. This analysis can also assist with estimating the depth of closure, overwash, profile equilibration and longshore loss rates. While the data is most specifically applicable to Barataria Basin and Chandeleur Islands, it can provide insight to coastal processes elsewhere along Louisiana's coast. Available data sets have typically been collected several years apart, and/or only include shoreline position as opposed to a complete profile.

Numerical Modeling Study of Pulsed Diversion Discharge on Salinity Distribution, Oil Slick Transport, and Fish Movement in the Breton Sound Estuary

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Pulsed re-introduction of Mississippi River water into the deltaic plain has been proposed as a wetland restoration strategy for coastal Louisiana. In this study, the hydrodynamic and salinity responses of the Breton Sound estuary to several pulsing scenarios of Mississippi River water via the Caernarvon diversion structure were investigated using the three-dimensional, baroclinic, Finite-Volume Coastal Ocean Model (FVCOM). The numerical model domain covers continental shelves along Texas, Louisiana, Mississippi, and Alabama, and has a very high horizontal resolution (on the order of ~10 – 50 m) in the upper Breton Sound estuary. After successfully validating the model with field observations, four numerical experiments were run to assess the response of current, salinity, water level, and marsh flooding to different diversion discharge scenarios. The four scenarios considered were: a 3-month high discharge scenario of ~ 200 $m^3 s^{-1}$ corresponding to the actual diversion discharge in April-July 2010, a 2-week pulsed scenario of ~ 200 $m^3 s^{-1}$ corresponding to the diversion discharge normally occurred in spring season, an almost constant discharge scenario of ~ 35 $m^3 s^{-1}$ corresponding to the annually averaged discharge, and a scenario with no discharge. Numerical simulation results indicated that 35 $m^3 s^{-1}$ discharge caused little change in wetland inundation and salinity compared to the no discharge case and, thus exchange between deep channels and the wetlands was not improved by the 35 m3 s^{-1} discharge. In contrast, the 2-week ~ 200 $m^3 s^{-1}$ discharge caused enhanced water exchange between wetlands and adjacent water bodies, substantially increasing water velocities in the narrow bayous and channels of the upper estuary. A noticeable reduction of salinity in the mid-estuary (about 10 to 20 km from the diversion) was also predicted. These effects caused a noticeable increase in down-estuary residual current, with a significant reduction of local estuarine residence times for the whole estuary. The 3-month high discharge scenario was the only scenario that had effects farther than 40 km from the diversion structure.

Oil slick simulations indicated that the 3-month ~ 200 m3 s-1 high diversion discharge drove most of the oil particles, initially located at the entrance of the estuary, out of the estuary and moved them along the coastline to the Mississippi Sound. In contrast, the no discharge scenario allowed most oil particles to travel upstream into the estuary. This difference can be explained by the relatively large contribution of the long diversion freshwater release to the residual currents. Individual-based fish modeling involved assigning complicated movement behaviors to the particles based on salinity as the cue. Movement was simulated using kinesis, restricted-area, and event-based approaches. These alternative movement approaches have been tested on both an idealized test grid and on the Breton Sound grid for the period from 1 April to 1 July 2010. The analysis of fish movement results is still ongoing.

Implications

Our study will provide a quantitative scientific tool to be added to the growing toolbox for assessing the utility and effects of river diversions for coastal restoration. Our numerical model addresses several important issues such as the hydrodynamic, salinity, and estuarine residence time responses related to freshwater river diversions, whether high diversion discharges can prevent oil slicks from flushing into the Breton Sound estuary, and quantifying how diversions cause displacement and salinity stress of key fish species. Our methods and results can also be used to refine coastal restoration planning in other diversion locations along the Louisiana coasts.

Assessment of Body Size and Sex Ratios in Gulf Killifish (Fundulus grandis) From Sites in Barataria Bay, LA. Impacted by the Deepwater Horizon Oil Spill

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The purpose of our study was to assess the impact of contaminants from the Deep Water Horizon oil spill on the heath and reproductive status of the Gulf killifish (*Fundulus grandis*). In our preliminary studies we sampled 11 sites throughout Barataria Bay and areas just west of the Mississippi Delta for *F. grandis* during the months of August-September 2011. *F. grandis* was found at two impacted sites in Barataria Bay and both references sites in East Texas. The greatest number of *F. grandis* were collected at the reference sites. At the Sabine Pass reference site (N29 43.566,W093 52.844) we collected 220 *F. grandis* during the three collecting trips. At McFaddin National Wildlife refuge (N29 40.234, W094 04.565) we collected 8 *F. grandis*. However, this site was sampled only once in late October during a winter storm and water temperatures were unusually cold (11.7° C). At two sites in Barataria Bay that were sampled in all three months, Bay Jimmy (N29 26.577, W089 53.987, most impacted) and Bayou St. Denis (N29 29.690, W090 01.061, less impacted) we trapped 14 and 46 *F. grandis,* respectively, during the three sampling trips. Body weights of *F. grandis* from the Sabine Pass reference site ranged from 1.06 g to 31.8 g. Equally large *F. grandis* were collected from McFaddin NWR, with the largest fish at 22.8 g. *F. grandis* collected from Bay Jimmy ranged from 1.25 g to 7.96 g. *F. grandis* collected from Bayou St. Denis, a less impacted site in Barataria Bay, ranged from 0.58 g to 11.2 g. Thus, we never collected sexually mature *F. grandis* greater than 12 g from any of the sites in Barataria Bay. There were no statistically significant differences in body weights of *F. grandis* collected from Sabine Pass, Bay Jimmy, or Bay St. Denis over three sampling trips. However, mean body weights of *F. grandis* from McFaddin NWR were statistically greater than any of the other three sites analyzed ($p < 0.05$). Sex of all fish preserved in formalin was performed using secondary sex characteristics and visual inspection of gonadal phenotype. For the Sabine pass reference site there were 100 females and 91 males for a sex ratio of 1:0.91 F:M. At site Bayou St. Denis the sex ratio was 6 females to 26 males or 1:4.3 F:M. For Bay Jimmy, the sex ratio was 3 females to 8 males or a ratio of 1:2.7 F:M. At McFaddin NWR, seven of eight *F. grandis* collected were female. Thus, the sex ratios were skewed towards fewer females in Barataria Bay. In conclusion, while body weight on average was greatest in fish from the NWR, there were fewer animals at the large end of the body weight range collected from Barataria Bay. Whether these site differences in number of *F. grandis* reflect the impact of the DWH oil spill is unknown and will await the contaminant analysis in tissues and water and sediment samples. This work was supported by a grant from the Gulf of Mexico Research Initiative.

Implications

Our data suggest fewer and smaller *F. grandis* collected from areas of Barataria Bay impacted by the DWH oil spill. Whether these differences are caused by contaminant exposure as a result of the oil spill is unknown at present. *F. grandis* is an important part of the marsh ecosystem, and our findings may have broader implications for the health of other marsh inhabitants in Barataria Bay. It should be noted these data are consistent with a recent study showing that *F. grandis* was acutely impacted by the DWH oil spill (Whitehead et al., 2011).

Myrtle Grove Modeling (Room 255)

Moderator: Brian Vosburg
CPRA

Myrtle Grove Delta Building Diversion: Field Surveys of Hydrodynamics and Sediment Transport in Lower Mississippi near Myrtle Grove River Bend

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Seven field surveys (October 2008 to May 2011) were carried out to capture a range of Mississippi River water discharges at the site of a proposed sediment diversion near Myrtle Grove, Louisiana (River Mile 60.7 above Head of Passes). The purpose of these surveys was 1) to provide local field observations to calibrate and validate numerical model predictions of sediment capture by the diversion, and 2) to define the general hydrodynamics and sediment transport regime of the lower Mississippi River in this tidally influenced reach. Surveys measured high-resolution multibeam bathymetry, hydrodynamics (ADCP), bedload transport (multibeam dune migration), and detailed sampling of the water column and channel bed for sediment concentration and granulometry (point-integrative isokinetic, bottom grab). Observational results indicate that sediment dynamics in this reach is controlled by a series of alternating lateral sand bars that are interrupted by a high-energy, deep (up to 60 m) meander bend where relict sediment is exposed on the channel bed. Flow associated with this bend is characterized by two secondary flow structures that generate upstream flow vectors locally, and impact bottom morphology. Fine-grained suspended sediment concentrations through the reach are partly decoupled from the water discharge cycle—reflecting the hysteresis of sediment supply from the drainage basin. Sand has a limited source from the basin, and is mainly derived from local resuspension on the bars, particularly associated with areas of large dunes.

Implications

In addition to the authorized diversion at Myrtle Grove, the results of the present study bear strongly on the larger sediment diversions proposed in the draft 2012 State Master Plan for restoring coastal Louisiana. The present surveys demonstrate that specific site selection and operation strategy has a first-order importance on the mass of suspended sediment captured per unit of water diverted.

Myrtle Grove Delta Building Diversion: Numerical Modeling of Hydrodynamics and Sediment Transport in Lower Mississippi near Myrtle Grove River Bend

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The Mississippi River Delta of south Louisiana USA is a highly engineered system with extensive levees, flood control, and diversion structures. This region is experiencing a high rate of coastal wetland loss. Solutions to recover or re-direct a portion of the River's sediment to benefit Louisiana's coast are currently being considered. As such, there is a great interest to analyze the impact and feasibility of sediment diversions. There is also a need to examine the optimum location, size and design of such land-building diversions. Three dimensional numerical modeling of hydrodynamics and sediment transport is used here to analyze a 6.7 mile reach of the Mississippi River, encompassing the proposed location of a sediment diversion near Myrtle Grove, Louisiana. The model domain extends from RM 56.0 to RM 63.2 above Head of Passes.

The three-dimensional model used in this study, FLOW3D, solved the full Navier Stokes equations. The model is capable of capturing complex geometries and resolving the free surface variations. The model was calibrated and validated against local ADCP velocity measurements, and suspended sediment discrete sampling over the water column and across the channel width. The model compared well with these measurements.

The model was used to assess the sediment diversion performance of two separate alignments with two different intake locations. Further, various diversion sizes (15,000, 45,000 and 75,000 cfs) were investigated. The numerical model results showed that the location and size of the intake structure, as well as the size and the alignment of the diversion channel are critical parameters affecting the sediment-water ratio captured by the diversion. The analysis shows that locating the intake over a lateral sand-bar increases the sediment-water ratio in the diversion. Further, the analysis shows that a larger diversion channel with a favorable alignment orientation with the flow direction in the river results in higher sediment-water ratio. It was observed that the dike component of the Modified Alignment design had an adverse effect on the flow field in the river (large eddy and potential sediment buildup on the downstream side). Thus, the dike was removed and the performance of the diversion was tested without it (run ND-RM60.7-45K). The results indicate that the dike does not enhance the performance of the diversion significantly. In fact, it is detrimental for some of the larger sediment size classes.

The results from this river model provided water discharge and sediment load to a bay-side morphological model (Delft-3D). The sediment load was provided for each sediment size class separately. The Delft-3D model was used to quantify the land building potential.

Implications

The analyses in this paper provides an insight into the water flow and sediment dynamics in this reach of the Lower Mississippi River and shows how this insight can be used as a guide to the location and design of a land-building diversion. The analysis performed shows that the diversion intake channel depth, alignment and orientation impact the sediment-water ratio. Results indicate that placing a relatively deep intake structure directly above a sand bar increases the amount of sand diverted. Further, the results indicate that increasing the diversion size improves the performance of a sediment diversion.

Basin Side Hydrodynamic And Morphological Modeling For The Delta Building Diversion At Myrtle Grove

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The Delta Building Diversion at Myrtle Grove (BA-33) project was initially proposed to be another large freshwater diversion project in the Barataria Basin in addition to the Davis Pond Diversion project. The Myrtle Grove Diversion project would involve installation of a diversion structure on the west bank of the Mississippi River between Ironton on the south and the Alliance Refinery on the north; a conveyance channel with parallel main-line flood control levees and an outflow channel with guide levees.
As initial studies for the project progressed, it was decided to also analyze the land-building potential if the project was modified to also act as a sediment diversion. Extensive data collection efforts, sediment transport analyses, numerical modeling and physical modeling of the Mississippi River; and a preliminary design of the diversion structure and conveyance channel were completed.

This presentation summarizes the basin side analyses of the Barataria Basin that have been accomplished. Initially, an estuarine hydrodynamic model was developed for evaluating the Barataria Basin effects due to operating both the Myrtle Grove and Davis Pond diversions at varying and increasing flow rates. This work was then built upon to pre-screen Myrtle Grove diversion flows for the State and other non-governmental organizations (NGO) in order to determine feasible diversion flows for a sediment diversion. The RMA2 model was used to evaluate maximum diversion magnitudes of 15,000 cfs; 45,000 cfs; 75,000 cfs; 150,000 cfs; 240,000 cfs and 300,000 cfs on water level and velocity increases in the basin. The purpose of these runs was to establish the upper limit of diversion magnitudes for further modeling by identifying the flows with significant, insurmountable impacts. Next, the hydrodynamic effects of three pulsing diversions were investigated. The pulsing interval was set at two weeks with the diversion operating and two weeks with a minimum diversion flow of 5,000 cfs.

The Delft3D modeling system was then used to obtain a general understanding of the potential land-building capacity within the Barataria Basin of the Myrtle Grove Sediment Diversion. The Mississippi River 3D Model developed by others provided sediment loadings through the diversion under different discharge conditions and was used as inputs for the Delft 3D model. The Delft system was then applied to model the sediment transport and morphological changes due to the sediment diversion over a period of 45 years.

Implications

This numerical analysis allows for a better informed decision as to whether enough sediment can be diverted at Myrtle Grove and delivered a significant distance into the Barataria Basin to build land; or whether the primary benefit of this diversion will remain the introduction of freshwater into the basin. It is one of the first attempts to directly quantify the amount of sediment that could be diverted from the Mississippi River, and to determine the extent and depths of the resulting deposition in the Basin. Additionally, the ensuing consolidation of the existing underlying material was analyzed to better determine the overall net effects of the sediment diversion.

Relative Sea-Level Rise II (Room 253)

Moderator: Jim Pahl

CPRA

Implications of Long-Term Water Level Variations for Coastal Marsh Sustainability

John Day[1], *Kam-Biu Liu[1], James Morris[2], Robert Rohli[1], Gary Shaffer[3]*

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We investigated factors responsible for long-term water level trends along the Louisiana coast and the implications of these trends for coastal marsh sustainability. We used the long-term water level record for Grand Isle. These data were detrended and passed through a 13 month filter to obtain monthly mean water level data. From 1955 to 1970 water levels were generally below the long-term detrended mean, sometimes by up to 10 cm. From 1970 to about 1995, water levels were generally above the long-term mean, by as high as 10 cm. From 1995 to 2011, water levels were below the long-term mean, again by up to 10 cm. There were large short-term water level variations. For example, from 1968 to 1975, mean annual water level increased by 18 cm. These short-term changes were much greater than average eustatic sea-level increase (2-3 mm/yr) and relative sea-level rise caused by subsidence (about 1 cm/yr). The period of high average water levels from 1970 to the mid 1990s was a time of high wetland loss while the low average water levels since the mid 1990s was a period of low wetland loss.

The observed changes in water level at Grand Isle during the 1970s to 1990s period seem to coincide with well-documented regional-scale changes in atmospheric and oceanographic conditions, which are expressed in a decrease in the Atlantic Multidecadal Oscillation (AMO) index (i.e., cooler Atlantic SST), a warm-phase (El Nino)-dominated ENSO, stronger upper atmospheric wind shear in the tropical Atlantic, and a significant reduction in hurricane activity. These atmospheric and oceanographic changes are part of the multidecadal cycles that are inherent in Atlantic climate variability. A physical mechanism remains to be identified to link these regional-scale changes with local water level variations at Grand Isle.

Implications

The regional-scale changes in atmospheric and oceanographic conditions suggest that the deviations from long-term mean detrended water levels are a cyclic phenomenon with a periodicity of about two to three decades and that water levels can be expected to increase within the next decade. This will usher in a period of high water levels similar to what was observed in the 1970s and 1980s. Since most wetlands in the coast are at the low end of their elevation range, the high water levels could cause a new period of high wetland loss.

Anticipating Coastal Community Habitat Changes and Implications for Developing Ecological Restoration and Management Measures That Accommodate Resiliency

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This presentation addresses the implications of anticipated changes to coastal ecosystems and natural habitats in the face of global climate change and predicted future changes in sea level rise, storms, and flooding influences. Coastal communities are faced with adapting to sea level rise climate change implications, nowhere more pronounced than along the Gulf Coast of Louisiana and Texas and along the Mid-Atlantic Coast. There are projected and expected impacts related to coastal infrastructure, real property and human safety and well-being. Also of particular concern are related impacts to natural systems including tidal wetlands, barrier islands, floodplains, and riparian habitats that are relied upon for delivering ecosystem services including storm surge and flood protection, erosion resistance, and water quality protection along with biodiversity conservation and provision of harvestable fisheries.

There is a growing need to understand how anticipated climate and coastal ecosystem changes may be projected to alter natural communities and their functions. This understanding is needed in light of municipal and infrastructure capitol improvements investments and land use planning including implications also of importance to individual coastal property owners. This presentation covers a series of assessment approaches and discussion of their implications related to sea level rise and flooding change impacts on coastal communities and the habitats they support, along with addressing how they can be predicted to change over the coming decades. Some planning level approaches and tools are discussed for gaining a preliminary understanding of how existing coastal habitats and their relative position in the landscape related to sea level and inundation, and how the range of predicted sea level rise under current to accelerated rate scenarios can significantly alter habitat distribution and persistence. The key implications relate to not only coastal community land and infrastructure planning, but for also identifying the need for ecological restoration approaches that are innovative and more adaptive to anticipated changes. The future ecological restoration and management scenarios need to be adaptive and resilient to an uncertain magnitude and pace of change, allowing stakeholders to adjust their planning and investments along the way. Case study examples are provided that for sea level rise habitat change planning for projects at Galveston Island, TX; Gibbstown, NJ; and Redwood City, CA. Other examples of ecological restoration projects that have relevance to attaining greater resiliency include projects in Barataria Parish, LA; Chesapeake Bay, MD; and Jamaica Bay, NY.

Implications

The topic of my presentation has implications for coastal restoration and planning consideration for communities along our coastal zones related climate change and sea level rise impacts to ecosystems and the habitats they support. This presentation will share some basic approaches and methods that have been used to provide a preliminary predictive as to how sea level rise changes over the coming decades may have significant impacts on natural habitat persistence and distribution. The magnitude of this issue for Gulf Coast states including Texas and Louisiana and Mid-Atlantic States such as Maryland, Delaware and New Jersey has additional ramifications for necessary improved and accelerated ecological restoration projects. This presentation covers several case studies and examples of what some coastal communities have been undertaking to address these issues with implications for strategies and approaches with applicability to other coastal areas.

Planning for Inland Migration of Coastal Wetlands Due to Sea Level Rise in Louisiana

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Louisiana contains over a third of the coastal wetlands in the contiguous U.S., but has seen a drastic reduction in total wetland area in the last century. This loss is especially troubling for coastal Louisiana where wetlands play a vital role in protecting and supporting the state's economy and culture. Under natural conditions, coastal wetlands will move upland with rising sea level or sinking land. However, engineered structures and shore armoring, such as levees, seawalls, and bulkheads, impede this process. Advanced planning for wetland migration is needed to keep communities and infrastructure out of harm's way from encroaching open water and to mitigate future wetland loss. This project investigates the potential for wetland migration in Louisiana through 1) the mapping and analysis of coastal wetland migration and 2) an examination of policy alternatives relevant to wetland migration.

Wetland loss and migration were analyzed in Lafourche, St. Mary, and Vermilion parishes using the Sea Level Affecting Marshes Model (SLAMM). Moderate and less optimistic values of subsidence rates were modeled with constant global sea level rise projections to identify the impacts of dike and levee protection on wetland loss and the upland migration of coastal wetlands. It was found that significant wetland migration into dry land areas did not occur in any of the three case study parishes unless dike and levee protection of undeveloped dry lands was removed. However, the intensity of subsidence and the distribution of dry land greatly impact the overall benefits of allowing coastal wetlands to migrate into dry lands.

The policy analysis was developed with consideration for the framework of Louisiana's Comprehensive Master Plan for a Sustainable Coast. An exploratory model was created to assist coastal managers and stakeholders in policy decisions regarding the migration of wetlands along Louisiana's coastline. The model was constructed using five main criteria and six different policy alternatives. Policy criteria included wetland migration, flood risk, equity, adaptability, and political feasibility, while the policy alternatives assessed were rolling easements, density restrictions, transferable development rights, conservation easements, defeasible estates and voluntary acquisition. Applying the policy model in scenarios where dike and levee protection is removed reveals that rolling easements would only be appropriate in Vermillion or St. Mary parishes where potential for wetland migration is high. In Lafourche parish, where potential for wetland migration is low, an emphasis on minimizing flood risk suggests that transferable development rights would be the best alternative to pursue. Applying the policy model in areas where dikes and levees are present also favors transferable development rights as the optimal policy alternative. Moreover, this final demonstration suggests that a wetland migration policy can serve to address the CPRA priority of minimizing "induced risk," while also adapting to changes in flood protection planning.

Implications

In the wake of Hurricane Katrina, the state of Louisiana recognized the need to integrate hurricane protection and wetland restoration efforts. This shift in policy is a marked improvement in coastal management. However, the important process of wetland migration is currently overlooked although sea level rise is a newly added component to the state's 2012 Coastal Master Plan. Developing an effective wetland migration policy requires key actions in order to prepare both state agencies and community stakeholders. Coastal managers need the most precise and up to date information available concerning likely wetland migration in order to implement efficient policy tools. A comparison of variable, yet similar studies will provide coastal managers with an increasingly robust understanding of how best to ensure the longevity of Louisiana's coastal wetlands.

Conceptualizing the Future of Coastal Louisiana (Room 252)

Moderator: Elizabeth English
University of Waterloo

Independent External Peer Review Critiques of Adaptive Management Plans for Large Scale Ecosystem Restoration Projects

Julian DiGialleonardo*[1]*, *Corey Wisneski*[1], *Jodi Creswell*[2], *Karen Johnson-Young*[1]

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Monitoring and adaptive management plans are an important component of many large scale ecosystem restoration projects, and if properly designed can increase the likelihood of achieving sustained success throughout the lifetime of the project. These plans are especially significant to restoration projects located in areas vulnerable to large natural or anthropogenic environmental impacts such as tropical cyclones, or the wide spread release of contaminants.

As a non-profit organization and impartial third party, Battelle has had the opportunity to manage numerous independent external peer reviews of ecosystem restoration projects located throughout the U.S.A., many of which encompass large areas along Gulf Coast states. Battelle has conducted a brief analysis of major or persistent issues identified by expert peer review panels regarding the development of adaptive management plans for large-scale ecosystem restoration projects. These independent reviews were conducted by subject matter experts ranging from coastal ecologists and geomorphologists to economists and cost engineers. Major issues identified include the need to build in sufficient flexibility in the planning framework that allows for the ready incorporation of new information into the planning process; the identification of specific conditions that will trigger the implementation of adaptive management activities; the importance of having a ecologically-based, long-term monitoring program with a duration that is not tied to funding endpoints; the incorporation of adaptive management costs into the total cost of the project; the clear identification of the entities responsible for monitoring and adaptive management decisions; the early development of comprehensive system tools required for restoration management; and the need to provide a range of potential actions to address the source problem, as well as their respective costs.

Implications

While it is understood that adaptive management plans by necessity are subject to the limitations of existing models and data, the goal of this review is to summarize, for restoration managers, planners, and scientists, the critical issues that should be addressed during the development of adaptive management plans at the feasibility level of project design. Identifying and addressing these recurring issues in the early stages of planning can help expedite project development, reduce the time and effort needed to revise multiple project aspects related to planning, and increase the likelihood of project success. Gleaned from many varied and multidisciplinary ecosystem restoration projects, the findings presented in this review are adaptive management truisms that can provide resource managers with valuable information regardless of the specific problems faced.

It's Much More Than a Pretty Picture - The Benefits of Adding Illustrative Master Plans to the Ecosystem Restoration Tool Box

***Georganna Collins*[1]**
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This presentation highlights the benefits of illustrative master plans, a tool very much lacking in the coastal restoration tool box and uses case studies to make the points. Clear articulation of the problem, goal setting, staging and phasing construction and budgets, to measuring success are all benefits. In many cases, ecosystem restoration problems are comprehensive and multi-faceted. Clear problem statement identifies all the issues and begins to set down opportunities and constraints. Planning for a master plan begins with goal setting. Goals, distinguished from objectives, clearly articulate what needs to be accomplished. Objectives, clearly stated, begin to elaborate on how goals would be accomplished. This phase of master planning ends with setting performance standards by which success is measured.

Often to ultimately reach an illustrative plan visually showing what is to be built where, numerous alternatives are laid out, researched, studied, and feasibly evaluated until a clear best plan emerges from all stakeholder involvement and comments. This is the phase where site inventories, the science and engineering come together, and become galvanized so a clear picture emerges. This clear picture, or illustrative master plan, quantifies the staging (where) and phasing (when) various plan components get built. This step plays a vital role in underpinning regional sediment management and prioritizing shoreline stabilization and marsh restoration, for example. Without a comprehensive illustrative master plan forged through a planning process, the result is typically what we see today, piecemeal projects scattered broadly across a landscape and various federal, state, and local entities competing against each other for limited financial resources.

An illustrative master plan is a tool that in large scale ecosystem restoration lays out the costs and the means to accomplish the set goals which too many times have been unclear or not articulated at all for an ecological system such as a Gulf coast estuary needing restoration, coastal protection, and sustainability facing global climate change.

Implications

This presentation helps the practitioner, regulator, funding entity, and public develop a more sound approach to large scale ecosystem restoration and be better able to answer the critical questions: are there ecological underpinnings to various coastal protection and restoration projects, does this project fit into a larger scale ecosystem restoration, and when they are pieced together, do they make a sustainable ecosystem?

World-Class Visions for a Self-Sustaining Delta Landscape

***Brian Jackson*[1]**
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This presentation describes the origins, development, structure, and anticipated launch of the Lower Mississippi River Delta Design Initiative. Currently under development through a partnership between Environmental Defense Fund and Van Alen Institute, the Design Initiative seeks to bring the best ideas to the table to address the physical, scientific, social, and economic challenges of designing—and implementing—a self-sustaining Louisiana delta landscape.

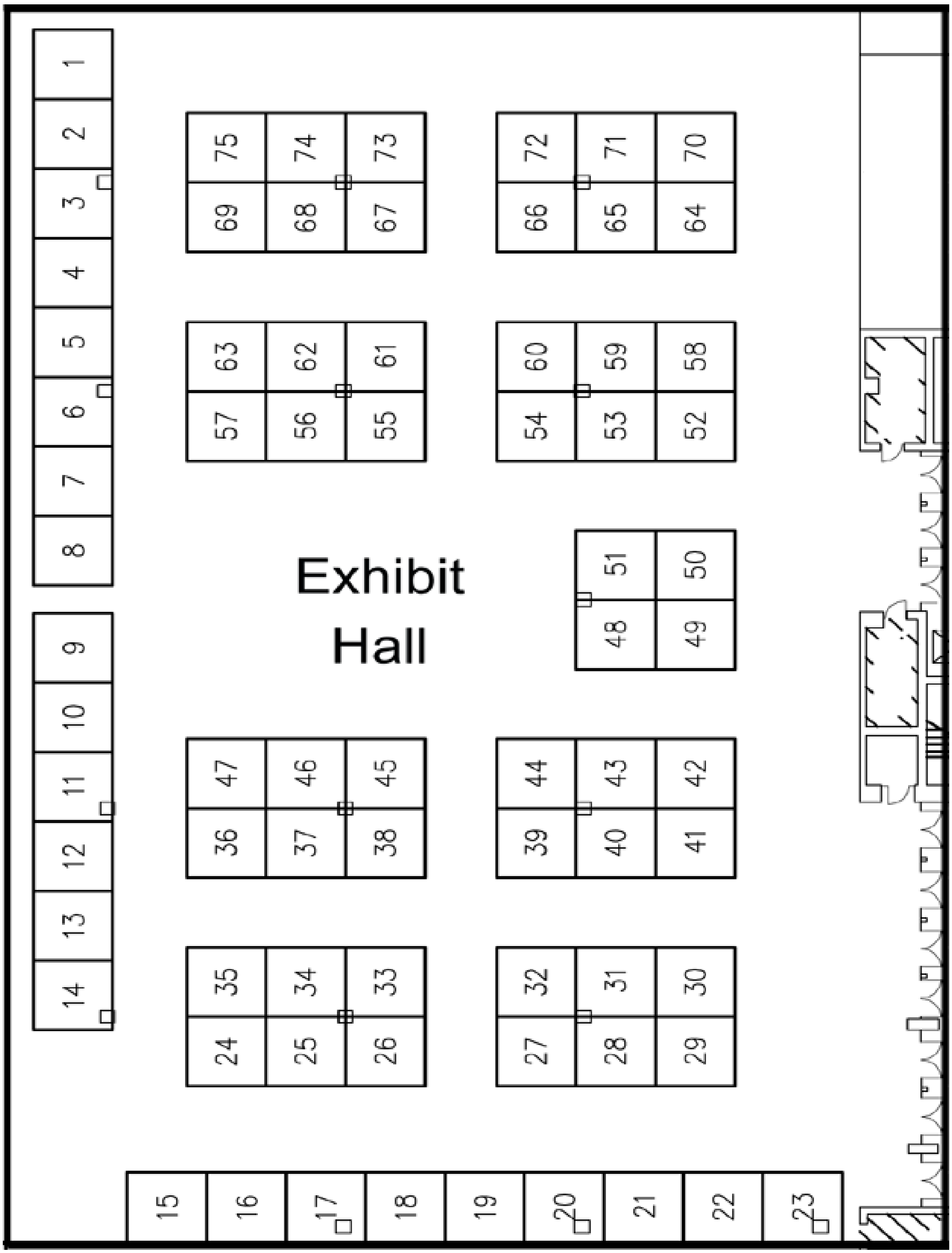
How will the Design Initiative work? We intend to bring teams of the world's best engineers, scientists, and public engagement experts to address—as the paid staff of the people of Louisiana—the question of what the future of the Mississippi River and its dependent resources and communities can be. We envision the Design Initiative as a highly-competitive, two-phase process that commissions these teams of engineers, coastal researchers, planners, architects, and landscape architects to work hand in hand. During a first phase, teams will respond to a Request for Qualifications that asks for world-class, realizable visions that reimagine the delta system as far as 300 miles upriver. During a second phase, one or more of these visions will be selected for further refinement. The results will be vetted by technical experts, representatives of stakeholder and community interests, and the public. Throughout the Design Initiative, the process will be tailored to be parallel, synergistic, and additive to the region's official master planning efforts. We will collaborate closely with federal, state, and local agencies to ensure that we tap their expertise and ideas, while framing the RFQ so that the teams' design solutions can be adopted into their planning process.

The resulting visions will, above all, restore the delta's natural dynamic. They may reconnect the Mississippi River with its wetlands through large-scale diversions that breach levees and release sediment from upriver. They may use former navigation channels and natural distributaries to rebuild coastal forests. They may engage upstream communities whose actions have huge impacts upon the delta's ecological and commercial health. They may propose new kinds of social and economic infrastructure that can adapt to this changing landscape, imagining housing, education, transportation, agriculture, and jobs that are sustainable and resilient. Success will be judged both on the merits in meeting the issues raised, but more importantly in bringing along public consensus as a result of a transparent design process.

Implications

The Design Initiative has major potential implications for south Louisiana. Never before has a design process of this scale been created to address social and ecological challenges of such urgency. The Initiative is tailored to produce not just new visions, but comprehensive solutions that are technically achievable. To this end, competing teams will be supported by a multi-million-dollar fund established through corporate sponsorship. Moreover, the Initiative is poised to take advantage of a historic window of opportunity. In the aftermath of Katrina and the Deepwater Horizon oil spill, a broad coalition has gathered to bring Gulf Coast communities, ecologies, and commerce back into balance. This alignment of interests is joined by an equally historic fund of civil oil spill penalties to put a plan into action. With our partners in Louisiana and around the world, we believe the Design Initiative can create a truly sustainable Lower Mississippi River Delta.

Exhibitor Booth Locations



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Notes

Notes

STATE OF THE COAST

PREPARING FOR A CHANGING FUTURE

Coalition to Restore Coastal Louisiana

CPRA

Coastal Protection and Restoration Authority of Louisiana