Conference Goal

To help the constituents of the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center address coastal resource management issues through the effective use of geospatial data and tools.

Conference Objectives

- Participants learn about emerging tools and techniques, and their benefits and applicability.
- Participants learn about the resources that are available to them, including training, data, and technology.
- Participants share best practices in the areas of geospatial data access, interoperability standards, and application development.
- The conference provides a forum to encourage the development of public and private partnerships that use geospatial technologies.

www.csc.noaa.gov/CoastalGeoTools/

The Geospatial Technology Conference for Coastal Professionals.

Kingston Plantation
Myrtle Beach, South Carolina
March 5 to 8, 2007

A Message from the Director of the NOAA Coastal Services Center

Dear Colleagues,

Technology is becoming increasingly vital to our rapidly changing world. Hurricanes, coastal development pressures, environmental changes—these are just a few of the issues coastal resource managers are using existing and emerging technologies to help address.

Coastal GeoTools ’07 will be an important conference for coastal management professionals to share their ever-expanding technical knowledge and experiences, discover promising new tools and techniques, and learn about available training, data, and technology resources.

Participants in GeoTools ’07 will share best practices in the areas of geospatial data access, interoperability standards, and application development, all in an inspiring environment that encourages collaboration and partnerships.

When the conference is over, attendees will know they are making the most of coastal management’s technology revolution.

The sun fun capital of the East Coast—Myrtle Beach, South Carolina—will once again be the venue for what is shaping up to be an exhilarating conference. While soaking up information on the newest and best uses of technology, attendees can also enjoy golfing, shopping, and fine dining, as well as an abundance of South Carolina’s stunning natural resources.

Don’t miss this opportunity to learn, share, and have fun.

Sincerely,

Margaret A. Davidson

Table of Contents

GeoTools ’07 Conference Exhibitors

3001 Inc.
Applied Imagery
Avineon Inc.
Dewberry
EarthData International Inc.
ESRI
Fugro Pelagos Inc.
Geo On The Go
Google
I.M. Systems Group
IVS 3D Inc.
Leica Geosystems
MDA Federal Inc.
NGPO Federal Geographic Data Committee
Perot Systems
Photo Science Inc.
Pictometry International
Sanborn
Sea Island Software
URS Corporation
Watershed Concepts (a division of HSMM)

Principal Sponsor

NOAA Coastal Services Center

External Committee

Kurt Allen	Photo Science Inc.
Peter August	University of Rhode Island
Hank Burch	Alabama Department of Conservation and Natural Resources
Bruce Carlisle	Massachusetts Office of Coastal Zone Management
Peter Claggett	U.S. Geological Survey Chesapeake Bay Program
Stu Davis	National States Geographic Information Council
Ivan DeLoatch	U.S. Geological Survey
Abby Friedman	National Association of Counties
Roger Gauthier	Great Lakes Commission
Tanya Haddad	Oregon Coastal Management Program
Anne Hale Miglarese	EarthData International Inc.
David Hart	University of Wisconsin
Paula Jasinski	NOAA Chesapeake Bay Office at the Virginia Institute of Marine Science
Cheryl Johnson	Watershed Concepts
Debbie Keller	The Nature Conservancy
Jeff Lillycrop	U.S. Army Corps of Engineers
Dave Maune	Dewberry
Josie Quintrell	National Federation of Regional Associations
Jim Schriever	Sanborn
David Shaw	Mississippi State University GeoResources Institute
Paul Veisze	California Governor’s Office of Emergency Services

Conference Overview

Monday, March 5

Training Sessions – 8:30 to 11:30 a.m. (See descriptions on page 7.)

Finding and Being Successful with Geospatial Grants

Remote Sensing – The Basics You Need to Know

New Tools from the NOAA Coastal Services Center

Special Interest Meetings – 1:00 to 4:30 p.m. (See descriptions on page 8.)

Coastal Mapping and Modeling – Inputs, Outputs, Uses, and Limitations of Coastal Information Products

Integrating Social Science Techniques into GIS

Web Mapping: Technology Overview, Lessons Learned, and Future Directions

Welcome Reception – Exhibitor Reception and Poster Session, Cambridge and Westminster Halls – 6:00 to 8:00 p.m.

Tuesday, March 6

Welcome and Keynote Panel, Kensington Ballroom – 8:30 to 10:00 a.m.

NOAA Coastal Services Center Welcome
Nicholas Schmidt, Chief, Coastal Geospatial Services, NOAA Coastal Services Center

Keynote Panel – Resilient Coastal Communities
Margaret Davidson, NOAA Coastal Services Center
Mike De Luca, Jacques Cousteau National Estuarine Research Reserve
Eileen Shea, NOAA Integrated Data and Environmental Applications Center
Tina Shumate, Mississippi Department of Marine Resources

Break – 10:00 to 10:30 a.m.

Morning Sessions – 10:30 a.m. to 12:00 p.m.

See abstracts on page 10.

Remote Sensing I Kensington A	**Coastal Mapping I** Kensington B	**Land Use Planning I** Kensington C	**Coastal Hazards I** Kensington F
A01. Development of a Remote Sensing Change Detection System as an ArcGIS Extension	A04. Planning for a Hyperspectral Survey	A07. Linking Demographic Profiles to Residential Land Use Patterns in Coastal North Carolina: Integration of Census Blockgroup and Parcel Data	A10. Applying the No Adverse Impact (NAI) Approach to Managing Hazards in Coastal Floodplains
A02. A Remote Sensing Hazard Guidance System for Analyzing Image Collection Opportunities	A05. USACE National Coastal Mapping Program	A08. Development, Training, and Application of an Integrated GIS System for Use by Local Government (Franklin County, Florida) for Tracking and Permitting Coastal Development in a Historically Rural County	A11. Hawaii Resource Information System for Coastal Hazards (HI RISC)
A03. Open Ocean Aquaculture Potential in the Exclusive Economic Zones with Remote Sensing and GIS: A Reconnaissance	A06. Opportunities and Challenges with Collecting and Processing LIDAR in Coastal Counties and Watersheds	A09. A Versatile Cellular Automata Model for ArcMap and ArcGIS Engine	A12. Geospatial Technologies Used in Hurricane Katrina Relief Efforts, What Was It Really Like...

Lunch, Kensington Ballroom – 12:00 to 1:30 p.m.
Exhibitor Hall Open: Kensington D and E
Poster Viewing: Oxford, Winchester, and Pembroke

Early Afternoon Sessions – 1:30 to 3:00 p.m.

See abstracts on page 16.

Remote Sensing II Kensington A	**Coastal Mapping II** Kensington B	**Land Use Planning II** Kensington C	**Coastal Hazards II** Kensington F
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B02.Land and Water Applications Using a New Tool for Hyperspectral and Multi-Sensor Data Analysis	B05. Creating a Geographic Information Systems Program across NOAA's National Marine Sanctuary System for Better Ecosystem Management Planning	B08. Development of a Dynamic Nonpoint Model	B11. Using ArcEngine to Build Decision Support Tools for Tsunami Emergency Management, Modeling and Planning
B03. A Case Study in the Use of SRTM and DEMs to Improve the Identification of Shrub Classes in Land Cover Classifications	B06. U.S. Army Corps of Engineers Approach to Regional Coastal Mapping	B09. Assessment of Anthropogenic Landscape Alterations in Coastal Watersheds for a Qualitative Measure of Potential Erosion Cells	B12. Shellfish Harvest Area Closure Decision Making Using Predictive Models

Break – 3:00 to 3:30 p.m.

Late Afternoon Sessions – 3:30 to 5:00 p.m.

See abstracts on page 22.

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C01. Comparing Digital & Analogue Imagery for Mapping SAV in SW Florida	C04. A Review and Current Status of VDatum, a Vertical Datum Transformation Tool	C07. Software Tools for Ecosystem-Based Management	C10. The Massachusetts Ocean Resource Information System – An Online Open Source Mapping Tool
C02. Coastal Marsh Inventory for the Critical Area of South Carolina's Coastal Counties	C05. The MapCoast Partnership: Bathymetric Mapping in Shallow Coastal Environments: Integrating Fathometry, GPS, and GIS	C08. Moving Marine Ecosystem-Based Management Forward: Geospatial Tool Interoperability, Standards and Protocols	C11. Great Lakes Circle Tour Coastal Access Guide: Using Web Mapping to Support Coastal Cultural Tourism
C03. Using the National Wetlands Inventory Data to Identify the Marine Component of a Coastal National Wildlife Refuge	C06. Terrain Data Integration for Coastal Flood Analyses in Coastal Mississippi	C09. EcoGIS – Demonstration of GIS Tools for Ecosystem-Based Fisheries Management	C12. Implementation of a Gazetteer for the Coast

Wednesday, March 7

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See abstracts on page 28.

Habitat Mapping II Kensington A	**Coastal Mapping: Decision Support Tools** Kensington B	**Tools for Ecosystem-Based Management II** Kensington C	**Coastal Hazards: Inundation** Kensington F
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D02. Mapping Salt Marsh Vegetation Using High Resolution Airborne Digital Camera Imagery	D05. ArcIMS for Land Use Planning in American Samoa	D08. Tools and Approaches to Accounting for Hazard Mitigation and Natural Resource Planning in an Ecosystem-Based Management (EBM) Framework: Community Vulnerability Assessment Tool (CVAT) & Marxan Decision Support Tool Interoperability	D11. Mapping Coastal Flood Zones with the WISE Coastal Module
D03. Pending	D06. Scenario-Based Decision Support System for Fisheries Conservation in the Gulf of Mexico	D09. Spatial Socioeconomic Tools: A Review and Recommendations	D12. Hurricane Katrina – The Aftermath: An Open Source Web Mapping Application

Break – 10:00 to 10:30 a.m.

Late Morning Sessions – 10:30 a.m. to 12:00 p.m.

See abstracts on page 33.

Remote Sensing III Kensington A	**Coastal Mapping: Management Applications** Kensington B	**Tools for Ecosystem-Based Management III** Kensington C	**Data Sharing II** Kensington F
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E02. Biogeo's Sampling Tool for GIS	E05. Mapping Regional Boating Patterns in Florida	E08. Where's My Habitat? Incorporating Fisheries Targets in an Ecoregional Planning Application	E11. The Ramona GIS Inventory System
E03. Habitat and Connectivity ArcGIS Toolboxes (HabitatToolbox and ConnectivityToolbox) for Multivariate Regression and Graph-Theoretic Marine Applications	E06. A Geodatabase of Boating Ordinances	E09. Pumping Blood into Ecosystem-Based Management Theory: A Planning Application Using Spatial Information on Marine Biodiversity and Fisheries	E12. GLINDA: A Distribution Model for Great Lakes Geospatial Data

Plenary Lunch, Kensington Ballroom – 12:00 to 2:30 p.m.
Dr. Susan Cutter, University of South Carolina
The Geography of Disaster Losses

Afternoon Sessions – 2:30 to 4:00 p.m.

See abstracts on page 39.

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F02. Developing Collaborative Landcover Data in Maine	F05. Visualizing the Texas Coast	F08. Working Waterfront Access: Mapping the Maine Coast's Economic Future	F11. The Gulf of Maine Ocean Data Partnership – Building a Region-Wide Information System to Support Gulf of Maine Resource Management
F03. A GIS Expert System for Riparian Buffer Delineation and Land Cover Mapping with High-Resolution Imagery	F06. Open Source GIS Software and Its Potential Use in the Post Grad Environment	F09. Shoreline Change Analysis and Planning using ArcGIS Model Builder	F12. Coastal Sensor Web Enablement: Syntactic Standardization and Semantic Enrichment

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Thursday, March 8

Early Morning Sessions – 9:00 to 10:30 a.m.

See abstracts on page 46.

Habitat Mapping III Kensington E	**Coastal Mapping: Shoreline Change I** Kensington F	**Land Use Planning: Conservation** Windsor Ballroom	**Data Sharing III** Somerset
G01. The MapCoast Partnership: Mapping Subaqueous Soils in Shallow Estuarine and Lagoonal Ecosystems	G04. Post-Hurricane Evaluation of the Performance of Coastal Armoring Structures Utilizing Spatial Analyst	G07. Connecticut's Coastal Land Assessment Methodology (CLAM)	G10. Development of a Spatially-Enabled Database in Support of Southeastern Tidal Creek Research at the NOAA Hollings Marine Laboratory
G02. Underwater Video Mapping for Assessing and Monitoring Coral Reef Ecosystem Health	G05. Lidar Analysis of Storm-Induced Geomorphic Change of a Texas Barrier Headland	G08. Open Space Analysis, South Shore Estuary Reserve, Long Island, New York	G11. The Hydrologic Dashboard: Accessing and Visualizing Web Services to Support Water Resource Management
G03. An Ecological Characterization of the Gulf of Maine Region	G06. Shoreline Sediment Erosion in the Chesapeake Bay	G09. Linking Marine and Terrestrial Conservation Planning	G12. Geospatial Interoperability Framework

Break – 10:30 to 11:00 a.m.

Late Morning Sessions – 11:00 a.m. to 12:30 p.m.

See abstracts on page 52.

Habitat Mapping: Benthic Environments Kensington E	**Coastal Mapping: Shoreline Change II** Kensington F	**Land Use Planning: Restoration** Windsor Ballroom	**Data Sharing IV** Somerset
H01. Benthic Complexity Modeling with Coarse Grain (90m) Bathymetric Data: Is It Possible?	H04. Field- And GIS-Based Measurements of Coastal Change for the Southeast Chukchi Sea, Alaska	H07. Modeling Future Land Cover Change in the Chesapeake Bay Watershed	H10. Setting a Standard and the Investment for Integration of GIS in the Watershed Management Process
H02. The Pros and Cons of Interferometric Sidescan Sonar for Coastal Habitat Mapping	H05. Assessment of Beach and Nearshore Dynamics Along the South Carolina Coast Utilizing RTK GPS Technology	H08. Modeling Performance Measures for an Urbanized Florida Estuary: Lake Worth Lagoon	H11. Introducing the Suwannee Information Gateway
H03. Benthic Mapping in Apalachicola Bay, FL: Summary of Acoustic Mapping Techniques and Findings	H06. Online Profile Analysis System: Web-based Data Loading, Storage, Analysis, Export, and Visualization Site	H09. A Web-enabled, GIS-Integrated Coastal Restoration Information Management System	H12. Achieving Freshwater Inflow Recommendation for Mission-Aransas Bay through Spatial Analysis

Conference Adjourns – 12:30 p.m.

Conference Abstracts and Detailed Agenda

Monday, March 5

Training Sessions

8:30 to 11:30 a.m.

Training: Finding and Being Successful with Geospatial Grants

The intent of this training session is to provide participants with tools and techniques to discover geospatial grant opportunities and submit highly competitive applications. This session will consist of two parts. The first part will cover how prospective applicants can find and apply for federal funding opportunities related to geospatial technologies, as well as suggest things applicants can do to increase their chances of submitting a successful proposal. The second part will address ways grantees should use the federal government's Grants.gov system and NOAA's Grants Online system to manage awards. It will also address best grants management practices, including post-award grant requirements.

Training: Remote Sensing – The Basics You Need to Know

Remote sensing provides a unique perspective on environmental features and conditions. As access to remotely sensed data is increasing, there are more data streams and options to consider. This training seminar provides an overview of remote sensing data and technologies and addresses applications of remote sensing in coastal resource management. The overview is designed to familiarize participants with the basics of remote sensing, including differences among types of data, available sensors and platforms for collecting data, benefits and limitations of the current technology, and examples of data application in a decision-support system.

Training: New Tools from the NOAA Coastal Services Center

Each year, the Center helps state and local officials apply new tools and data to specific coastal issues. In this session, see how technology is changing the way these officials and their organizations are doing business. Session presenters will highlight different projects, and a schedule posted prior to the session will help you decide which presentations you want to see.

Special Interest Meetings

1:00 to 4:30 p.m.

Special Interest Meeting: Coastal Mapping and Modeling – Inputs, Outputs, Uses, and Limitations of Coastal Information Products

This special interest meeting is intended to examine the processes involved in creating coastal geospatial information products such as flood maps, shoreline change maps, and inundation maps and models. The focus of the session will be on how data, modeling, and presentation work together to form the final products. Each step has its own considerations, which are transmitted both up and down the work chain. Common and unique products will be presented and their development, uses, and limitations discussed. With these products as a reference, the session will explore where we are headed, how we should get there, and what we ultimately want from future coastal geospatial information products. In short, this meeting is being held to bring together data providers, analysts, modelers, GIS professionals, and emergency managers and data users to discuss the next generation of coastal maps and their applications.

Special Interest Meeting: Integrating Social Science Techniques into GIS

Social science techniques can be used to solve a variety of natural resource-based problems. Such uses include assessment of public attitudes and perceptions of managerial issues, natural resource use patterns, economic impacts, and demographic trends. The intent of this special interest meeting is to provide participants with an introduction to social science principles, resources, and importance in coastal management. The session will describe past examples of social science applications, as well as demonstrate how social science information can be used in a GIS. The meeting will close with a discussion of how participants can combine social science information with their existing data to obtain a broader understanding of a particular issue.

Special Interest Meeting: Web Mapping: Technology Overview, Lessons Learned, and Future Directions

This special interest meeting will highlight a range of Web-mapping technologies available to the coastal resource management community. For each of the technologies covered in this meeting, the following topics will be addressed: overview of core functionality and components, appropriateness of use to meet common Web-mapping and data-provisioning requirements, lessons learned, and implementation considerations. The meeting will also feature demonstrations of representative Web-mapping sites and look at future directions, which must be considered before starting a new project. Additionally, there will be a discussion on how Web-mapping tools are being used as part of an enterprise approach to distributing data at the NOAA Coastal Services Center and the National Ocean Service.

Welcome Reception – Exhibitor Reception and Poster Session

6:00 to 8:00 p.m.

Meet the exhibitors and poster presenters in the Cambridge and Westminster Hall areas at Kingston Plantation for an informal reception and viewing of the exhibits and posters to be displayed at the conference. Light hors d'oeuvres and a cash bar will be provided. Note that additional guests will incur an added cost of $50 a person.

Tuesday, March 6

Welcome and Keynote Panel

8:30 to 10:00 a.m.

Kensington Ballroom

NOAA Coastal Services Center Welcome
Nicholas Schmidt, Chief, Coastal Geospatial Services, NOAA Coastal Services Center, Charleston, South Carolina

Keynote Panel
Resiliency is about absorbing shocks and bouncing back. This concept is particularly important in the coastal zone, where development, competing demands for resources, and natural and man-made disasters threaten communities. During the opening session and throughout the conference, GeoTools participants will uncover many ways in which they can help their communities become more resilient. Keynote panel members will discuss resiliency and share how technology has helped them improve their communities' resiliency.

Margaret Davidson, NOAA Coastal Services Center
Mike De Luca, Jacques Cousteau National Estuarine Research Reserve
Eileen Shea, NOAA Integrated Data and Environmental Applications Center
Tina Shumate, Mississippi Department of Marine Resources

Break

10:00 to 10:30 a.m.

Morning Sessions

10:30 a.m. to 12:00 p.m.

Remote Sensing I

Kensington A

A01. DEVELOPMENT OF A REMOTE SENSING CHANGE DETECTION SYSTEM AS AN ARCGIS EXTENSION
John Jensen, Jungho Im, and David J. Cowen, University of South Carolina
María J. García Quijano, Florida Atlantic University

As part of the NASA Research, Education and Applications Solution Network (REASoN) project, a team at the University of South Carolina has been developing a Spatial Decision Support System (SDSS) to provide improved management of technological hazards. The Remote Sensing-assisted Natural and Technological Hazards Decision Support System is designed to maximize the use of remote sensing. The system is being evaluated by Department of Energy and Environmental Protection Agency personnel. An objective of the SDSS is to monitor the hazardous waste site so that compromise can be identified as soon as it happens. This paper will describe a robust remote sensing change detection system (RSCDS) that has been designed to meet this objective. This system which has been implemented as an ArcGIS extension includes neighborhood/object correlation image analysis, several sampling options, expert system inference engines, and an automated binary change detection model using single and/or multiple variables. The system provides tools for verification of the results and sophisticated chart generation tools to visualize and report findings. As an integral part of the ArcGIS environment, all the input and output data sets can be readily incorporated into a GIS environment. Several studies utilizing the RSCDS have been completed that identify and measure minute changes between data sets. The system is designed to be highly versatile and has been successfully used with many remote sensing data sets, including scanned historical aerial photos, high spatial resolution hyperspectral imagery, and LIDAR data.

A02. A REMOTE SENSING HAZARD GUIDANCE SYSTEM FOR ANALYZING IMAGE COLLECTION OPPORTUNITIES
Michael Hodgson, University of South Carolina
Bruce A. Davis, NASA Stennis Space Center
Yang Cheng, NASA Jet Propulsion Lab
Bandana Kar, University of South Carolina

Planning for the collection of remotely sensed imagery requires the consideration of multiple criteria. Such criteria may be categorized into those factors about the land cover/phenomena under investigation, the environmental factors influencing imagery, geographic extent, geographic scale, satellite/sensor characteristics, and application requirements. Some of these factors are space and time dependent, such as the fixed orbits of satellites (satellite sensor characteristics), solar, atmospheric, and tidal variations (environmental), and land cover/phenomena diurnal or seasonal phenology. The joint consideration of these factors may be complex. In the context of disaster response, the consideration of these factors with the availability of satellite-borne sensors from diverse companies/agencies is overly time-consuming. Geographical information for mapping hazard damage must be provided very quickly (e.g., 1-3 days) to be used in emergency response or soon (e.g., within 2 weeks) to be used for cleanup. In a joint effort with NASA and Kinetx, Inc., the University of South Carolina is developing the Remote Sensing Hazard Guidance System (RSHGS), a web-based spatial decision support system guiding managers and analysts in the process of acquiring and analyzing remotely sensed imagery for hazard response. The RSHGS is composed of three primary subsystems. The intelligence subsystem will use the GIS-based modeling subsystem and satellite query subsystem to automatically determine optimum sensor and satellites for the hazard requirements, geographic study area, and time frame (e.g., 48 hours). A GIS-based hazard modeling subsystem will predict the area of impact from this hazard event. Satellite remote sensing opportunities will be rapidly identified.

A03. OPEN OCEAN AQUACULTURE POTENTIAL IN THE EXCLUSIVE ECONOMIC ZONES WITH REMOTE SENSING AND GIS: A RECONNAISSANCE
James Kapetsky, C-FAST, Inc.
Jose Aguilar-Manjarrez, Food and Agriculture Organization of the United Nations

The open ocean is seen as a new opportunity for the seaward expansion of aquaculture in order to relieve nearshore problems that include competing and conflicting uses as well as environmental and aesthetic issues.

The basic requirements for open ocean aquaculture (OOA) are straightforward. For OOA to be sustainable the production environment has to be conducive to good growth, good survival, and result in a product of good quality. The culture structure has to be durable in all sea conditions and it has to be economic to construct and maintain. A third key consideration is access. Access is an all encompassing requirement. Basically, there has to be physical and administrative access to the surface, water column, and seafloor at the culture site. Additionally, there has to be a shore support facility and access from it to the offshore aquaculture site via an inlet to the sea. Transport of stocking material, feed, and the harvested product as well as monitoring and maintenance trips, all depend on reliable access.

Our study demonstrates that, using freely downloadable GIS and remotely sensed data and indicative species and culture systems, a first approximation of open ocean aquaculture potential can be made for the U.S. Atlantic, Gulf of Mexico, and Puerto Rico-USVI EEZs. Improvement of the GIS is discussed in terms of available data and data needs. More broadly, we show that there is an important role for GIS and remote sensing in many aspects of marine aquaculture development and management that have a spatial context.

Coastal Mapping I

Kensington B

A04. PLANNING FOR A HYPERSPECTRAL SURVEY
Herbert Ripley, Hyperspectral Imaging Limited

There is increasing use in today's coastal science community of airborne hyperspectral surveys. A growing knowledge base exists of what hyperspectral surveys can provide. However there is also a notable lack of understanding of what issues must be dealt with to plan and successfully complete a coastal hyperspectral survey. This paper will focus on how to effectively plan a coastal hyperspectral survey and will cover a background to the technology as well as physical factors that will affect a survey. How to minimize these impacts and how to deal with them when and if they occur will be covered. Examples will be drawn from actual project work and used in the presentation.

A05. U.S. ARMY CORPS OF ENGINEERS NATIONAL COASTAL MAPPING PROGRAM
Charles Wiggins, U.S. Army Corps of Engineers, Airborne Lidar Bathymetry Technical Center of Expertise

The U.S. Army Corps of Engineers' Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) began its National Coastal Mapping Program (NCMP) in 2004. During the last 3 years under the NCMP, JALBTCX surveyed the coastal zone along the northern Gulf of Mexico, Florida's west coast, the Atlantic seaboard from Miami, Florida, to Long Island, New York, and a portion of the Great Lakes shoreline. The Compact Hydrographic Airborne Rapid Total Survey (CHARTS) system, owned by the Naval Oceanographic Office, collected much of the data. The CHARTS sensor collects bathymetric and topographic lidar data along with RGB and hyperspectral imagery from a single platform. Besides providing these data in point and raster format, the JALBTCX generates GIS format products from the native point and raster data. Based on input from the GIS community, these products target the needs of analysts and engineers so that their time may be spent working with information rather than generating information with which to work.

A06. OPPORTUNITIES AND CHALLENGES WITH COLLECTING AND PROCESSING LIDAR IN COASTAL COUNTIES AND WATERSHEDS
Kenny Legleiter, Merrick & Company
Jamie Young, Sanborn Map Company

In 2005, the National Oceanic & Atmospheric Administration (NOAA) Coastal Services Center (CSC) awarded the Sanborn team, including Merrick & Company, a five year IDIQ contract for coastal geospatial services through the use of thematic mapping, airborne acoustic data acquisition, image processing and analysis, photogrammetric mapping, and decision support tools. During this past year, Sanborn and Merrick have acquired LIDAR for several coastal counties in Florida and Texas. During the acquisition and processing of the data, a number of issues arose that are not always common for non coastal areas that had to be handled to produce LIDAR products that met the specifications of the client. Some of the issues included weather, NGS benchmark subsidence, tidal influence, wetlands and marshes, changes along the coastline between time of acquisition and delivery of products, and the lack of roads for ground control. For a LIDAR project to succeed in coastal counties and watersheds, a number of concerns need to be planned for well in advance, defined during the scoping process, and creatively handled during the collection and processing of LIDAR data.

Land Use Planning I

Kensington C

A07. LINKING DEMOGRAPHIC PROFILES TO RESIDENTIAL LAND USE PATTERNS IN COASTAL NORTH CAROLINA: INTEGRATION OF CENSUS BLOCKGROUP AND PARCEL DATA
Tom Crawford, Don Bradley, and Bob Edwards, East Carolina University

High levels of population growth in coastal U.S. regions raise concern about development's impacts on coastal environments. Many communities are increasingly concerned about the problem of coastal sprawl. This study demonstrates an approach to link spatially varying demographic profiles to measures of residential sprawl for New Hanover County, North Carolina. It seeks to assess the degree to which regions characterized by high in-migration and high retirement-age population differs from regions with low in-migration and low retirement age population. GIS-based methods to construct residential sprawl trajectories over a 30-year period using parcel-level data are demonstrated. Census blockgroup data are segmented into discrete demographic categories and related to sprawl measures for a recent five-year period. Results indicate that regions with high levels of in-migration and high levels of retirement-age population tend to have higher rates of residential land consumption, have a more spatially dispersed residential land use pattern, and are associated with lower levels of surrounding land use diversity. Interviews with local planners and real estate professionals generally confirm these findings yet also identify localized pockets of complexity that defy this description. The use of aggregated spatial units such as blockgroups introduces problems associated with ecological fallacies. To overcome this limitation, we describe an approach to extend the analysis by engaging in primary data collection via a household survey that implements a spatially stratified sampling scheme. The approach can be extended to other regions and will be of interest to end users concerned with understanding patterns, processes, and implications of coastal development.

A08. DEVELOPMENT, TRAINING, AND APPLICATION OF AN INTEGRATED GIS SYSTEM FOR USE BY LOCAL GOVERNMENT (FRANKLIN COUNTY, FLORIDA) FOR TRACKING AND PERMITTING COASTAL DEVELOPMENT IN A HISTORICALLY RURAL COUNTY
Lee Edmiston, Nicole Selly, and Lauren Levi, Apalachicola National Estuarine Research Reserve, FL Department of Environmental Protection

Franklin County, located in northwest Florida, has historically been a rural, sparsely populated county that depended on the commercial seafood industry for 80% of the jobs locally. The oyster industry, in particular, is subject to strict Federal Food and Drug Administration rules on coliform concentrations, which makes it vulnerable to the effects of increasing coastal development. Growth in housing construction and tourism has begun to transform the area resulting in rapid coastal development. Many projects currently in the planning stages will need county review and approval prompting zoning and land use changes.

The Apalachicola National Estuarine Research Reserve (ANERR), a Marine Protected Area (MPA) in Franklin County, encompasses approximately 246,000 acres, most within the county. Besides MPA's, this project addresses smart coastal growth by providing spatial data and natural resource information in a user friendly format to county government planners, and the integration of data access and distribution of both local and regional information. This project, in partnership with NOAA's Coastal Service Center, is providing the county and stakeholders with a spatial awareness of the local resources that promotes consistent compliance with ordinances and provides a modern permit tracking system. Resulting analysis can be used to help citizens understand the effects of local development. Utilizing GIS to track permits, compliance, and growth will also assist the ANERR in its goal of managing and protecting important natural resources within and adjacent to its boundaries. Working with local government and end users ensures a sustainable, user-friendly system that can benefit both sides.

A09. A VERSATILE CELLULAR AUTOMATA MODEL FOR ARCMAP AND ARCGIS ENGINE
David Cowen, Thomas Bramble, Michael Hodgson, and John Jensen, University of South Carolina

As part of a NASA Affiliated Research Center research project on Smart Growth, a research team at the University of South Carolina has developed a Visual Basic for Applications (VBA) application to operationalize Cellular Automata models as an ArcGIS extension and a web based application using ArcGIS Engine. Cellular automata models have been used extensively to model dynamic spatial processes including urban growth. The paper will report on the development and calibration of the ArcGIS extension using VBA and ArcObjects and the migration to ArcGIS Engine. The required inputs are only a grid of existing development and masks of the study area and cells that cannot be developed. The system incorporates forms to assign parameter weights to other layers and scenario functions that allow the model to automatically simulate multiple scenarios of growth. A visualization function automatically generates map compositions of the predicted growth at the end of each simulation. The paper will demonstrate how the system was utilized to model urban sprawl in Beaufort County, SC between 1990 and 2000 and the effort to validate the model using census information. The final part of the paper will report on the current effort to implement the model at the state level using GAP data and other inputs for all of South Carolina.

Coastal Hazards I

Kensington F

A10. APPLYING THE NO ADVERSE IMPACT (NAI) APPROACH TO MANAGING HAZARDS IN COASTAL FLOODPLAINS
Maria Honeycutt, URS Corporation, Homeland Security and Emergency Services Group
Keelin Kuipers, National Oceanic and Atmospheric Administration
Alan Lulloff, Association of State Floodplain Managers
Douglas Harper, National Oceanic and Atmospheric Administration

Beginning in 2005, the Association of State Floodplain Managers (ASFPM) partnered with the NOAA Coastal Services Center to develop a new handbook, "No Adverse Impact in the Coastal Zone." Geared towards local officials, this handbook explains the No Adverse Impact (NAI) approach to development in coastal floodplains. Like its riverine companion document (published by ASFPM in 2003), the coastal NAI handbook presents community- and individual-level actions that promote a "Do No Harm" philosophy. When developing in or near floodplains, no property owner (including the government) may take an action that increases hazards or diminishes a natural resource without taking steps to eliminate or mitigate all adverse impacts. In the handbook, the practices for identifying and mitigating adverse impacts are organized under seven "Building Blocks," or discipline areas, and in three levels under each Building Block (basic, better, and NAI). Implementing an NAI approach empowers local officials and others engaged in management of coastal resources and hazards to require that all new development activities in coastal floodplains will not cause adverse impacts to other property owners in the community, including the public.

This presentation will explore how geospatial technology can play an integral role in implementing each of the coastal NAI Building Blocks. Emphasis will be on those Building Blocks that benefit most significantly from integration with geospatial technology, such as Hazard Identification and Mapping, Planning, Emergency Services, and Education and Outreach. The presentation will include examples of better- and NAI-level activities, including many featured in the new coastal NAI handbook.

A11. HAWAII RESOURCE INFORMATION SYSTEM FOR COASTAL HAZARDS (HI RISC)
Chris Chiesa, Zodd Bosse, Pam Cowher, Steve Kunitzer, and David Askov, Pacific Disaster Center

The "Hawaii Resource Information System for Coastal Hazards" (HI RISC) is an interactive, map-based application supporting integration and dissemination of data and information products supporting risk management activities within Hawaii and the Pacific. It has been developed under funding from NOAA through its Pacific Region Integrated Data Environment (PRIDE) Program. The HI RISC Map Viewer is based on PDC's popular "Asia Pacific Natural Hazards and Vulnerability Atlas" ("Hazards Atlas;" *http://atlas.pdc.org*) and incorporates a wealth of geospatial data and information including: (1) baseline hazard data and information (including tsunami evacuation zones, FEMA flood zones, lava hazard zones, earthquake and tropical storm intensity zones, and historical hazard events such as earthquake epicenters, tsunami run-up locations, and tropical storm tracks); (2) real-time and modeled hazard information for tropical storms (such as current location and status, forecasted positions, and Consequence Assessment Tool Set (CATS) wind damage maps); earthquakes and tsunamis (such as reported epicenters, HAZUS damage assessment maps, and tsunami travel time maps); wildfires (including satellite-based fire hot spots, fire fuels, and forecasted fire hazard danger rating indices); (3) at-risk resources (including population centers, environmentally-sensitive areas, locations of cultural importance, and critical economic infrastructures); and (4) emergency services (e.g. police and fire stations,

hospitals, emergency shelters, and evacuation zones), all along with baseline geospatial data including digital elevation models, high-resolution satellite imagery, transportation networks, and political and administrative boundaries. As HI RISC evolves, it is expected to serve the needs of both risk management planners and disaster managers.

A12. GEOSPATIAL TECHNOLOGIES USED IN HURRICANE KATRINA RELIEF EFFORTS, WHAT WAS IT REALLY LIKE . . .
Louis Wasson, David Shaw, and Wade Givens, Georesources Institute, Mississippi State University

Hurricane Katrina brought together geospatial technologies that are routinely used together in many scientific applications. GIS, Lidar, remote sensing and other high tech tools were brought together in the greatest natural disaster to ever hit the United States. As the tropical storm moved through the warm waters of the Caribbean and Gulf of Mexico, Hurricane Katrina amassed enough energy to create a 28 foot storm surge and sustained winds of 135 mph with gust to 150 mph when it struck the entire coast of Mississippi. After the hurricane moved inland and away from the devastated coast what happened next? GIS immediately came into play and assisted in saving hundreds of critically injured and stranded survivors along the Mississippi coast during search and rescue missions. NOAA and other federal agencies along with commercial companies flew aerial and satellite missions creating a large inventory of imagery. Which technology worked or failed and why? From a personnel perspective, what was it really like using technology with intermittent power, limited storage capacity on your laptop, little communication, no internet and very little sleep? What geospatial data is needed before the next catastrophe strikes?

Lunch

12:00 to 1:30 p.m.

Exhibitor Hall Open: Kensington D and E

Poster Viewing: Oxford, Winchester, and Pembroke

Early Afternoon Sessions

1:30 to 3:00 p.m.

Remote Sensing II

Kensington A

B01. DENSIFICATION USING SPECTRAL CLUMP INTERSECTION
François Smith and Ed Engle, MDA Federal

Ancillary data layers such as NWI and others are very useful in land cover classification when used as independent variables. However they often create artifacts in the results because they do not match the source imagery spectral boundaries. There is a technique that allows the user to intersect ancillary data with source imagery spectral clumps so that the ancillary data spatial configuration matches the imagery. When the intersected, or densified, ancillary data is then used as an independent variable in a CART or regression tree classification, no artifacts occur in the result. Also this process can be used to increase the accuracy of continuous datasets to be used as training or a dependent variable in a regression tree classification because it will reduce the possibility of a sampled training point existing in overlap areas where the datasets do not match up properly.

B02. LAND AND WATER APPLICATIONS USING A NEW TOOL FOR HYPERSPECTRAL AND MULTI-SENSOR DATA ANALYSIS
Charles Bachmann, Thomas L. Ainsworth, and Robert A. Fusina, Naval Research Laboratory

The Coastal and Ocean Remote Sensing Branch at the Naval Research Laboratory has developed a tool for modeling nonlinear structure in remote sensing imagery. Known as “Manifold Coordinate Analysis Workshop” (MCAW), the tool uses a data-driven method to extract a direct parameterization of data nonlinearity in a set of reduced coordinates. These coordinates provide a rich set of features useful in both land and water applications. Substantial testing and validation of this new tool have occurred using airborne hyperspectral imagery acquired at various study sites where our Branch has active projects. In this presentation, we focus on two areas: the Virginia Coast Reserve Long Term Ecological Research (LTER) site, a chain of barrier islands, shallow water lagoons, and mainland marsh systems on Virginia’s Eastern Shore; and the Indian River Lagoon, FL.

B03. A CASE STUDY IN THE USE OF SRTM AND DEMS TO IMPROVE THE IDENTIFICATION OF SHRUB CLASSES IN LAND COVER CLASSIFICATIONS
Chris Moller and Janet Hoyt, Sanborn Inc.
Russ Congalton, University of New Hampshire, Dept. of Natural Resources

As part of the NOAA Coastal Change Analysis Program (C-CAP), Sanborn, Inc. has classified several coastal regions ranging from the West Coast to the Gulf Coast. To capture phenological variation within project areas, NOAA uses the USGS’ triple date imagery sets that coincide with the National Land Cover Dataset project. Three seasonal dates of imagery (spring, leaf-on, and leaf-off) are used with a latest date image compiled from a combination of the three seasonal dates. Many classes such as evergreen forest and unconsolidated shore are relatively easy to capture but transitional classes like scrub shrub consistently provide a challenge. Due to spectral similarities between shrub signatures and younger and/or lower density tree stands, this class is not readily captured by traditional supervised or unsupervised classifications. With the increasing availability of multiple online data sources, it may now be practical from a production standpoint to use these sources to more accurately map some of these confused classes. Shuttle Radar Topography Mission (SRTM) and Digital Elevation Model (DEM) data are available for the entire conterminous U.S. and may allow us to compare differences in height between image dates to distinguish shrub from forest. As part of NOAA’s C-CAP project, Sanborn tested this methodology in Zones 55 and 58, which include the coastal regions of Florida, Georgia, South Carolina, and North Carolina. This paper presents a discussion of the methods and results of that process.

Coastal Mapping II

Kensington B

B04. PROMOTING AN INTEGRATED OCEAN AND COASTAL MAPPING PROGRAM
John Palatiello, Management Association for Private Photogrammetric Surveyors
Kurt Allen, Photo Science
Anne Hale Miglarese, Earthdata International

Several recent studies and initiatives, including “An Ocean Blueprint for the 21st Century”, the final report of the U.S. Commission on Ocean Policy, the National Academy of Science study, “A Geospatial Framework for the Coastal Zone”, and discussions of a “Digital Coast” initiative and a “Coastal National Spatial Data Infrastructure” (C-NSDI) provide some useful recommendations that can lead to the creation of an Integrated Ocean and Coastal Mapping program. Such an integrated approach will provide economy and efficiency in the conduct of ocean and coastal-related mapping and other geospatial activities, and put vitally needed data and information in the hands of decision makers ranging from resources managers to local planning and zoning officials to first responders.

While NOAA has discussed the concept of an IOCM program, the success of such a program is dependent on taking IOCM from the conceptual to implementation phase, and realizing IOCM is a commercially available, operational program, not a research effort. Legislation to create a framework for an IOCM (S. 364) was introduced in the 109th Congress; the bill was not enacted into law. The bill fails to establish a strong, operational IOCM program that recognizes the broad and varied services and data products available from the private geospatial community.

This paper will discuss a new, fresh approach to a robust and operational oceans and coastal mapping program, one that harnesses all stakeholders at the Federal, state and local level, provides authorization for program leadership and coordination by NOAA, and utilizes the myriad of capabilities that can be provided by private sector geospatial firms.

B05. GIOVANNI FACILITATES INVESTIGATIONS OF COASTAL ENVIRONMENTAL PROCESSES WITH NASA REMOTE-SENSING DATA
James Acker, Gregory Leptoukh, Steve Kempler, and William Teng, Goddard Earth Sciences Data and Information Services Center

The Goddard Earth Sciences Data and Information Services Center (GES DISC) Interactive Online Visualization ANd aNalysis Infrastructure (Giovanni) provides quick access to easy-to-use, remotely-sensed data that are applicable to investigations of coastal environmental processes. These data sets include precipitation data from the Tropical Rainfall Measuring Mission (TRMM), which are particularly useful for coastal storm investigations; ocean color data from the Sea-viewing Wide Field-of-view Sensor (SeaWIFS) and Moderate Resolution Imaging Spectroradiometer (MODIS), useful for water quality evaluation, phytoplankton bloom detection, and terrestrial-marine interactions; and atmospheric data from MODIS and the Advanced Infrared Sounder (AIRS), providing the capability to characterize atmospheric variables affecting the coastal zone. Giovanni provides researchers with a simple interface allowing rapid analysis of environmental data sets with accompanying graphic visualizations. Several examples of Giovanni investigations of the coastal zone will be provided, including hurricane impacts in the Gulf of Mexico, hydrologically-induced phytoplankton blooms and chlorophyll trends, and high aerosol optical depth events off of the U.S. Northeast Coast. Specific coastal zone issues for which Giovanni’s analytical capabilities can be utilized will be delineated.

B06. U.S. ARMY CORPS OF ENGINEERS APPROACH TO REGIONAL COASTAL MAPPING
Rose Dopsovic, U.S. Army Corps of Engineers

The Spatial Data Branch, Mobile District, and the Coastal and Hydraulics Lab, Engineering Research and Development Center collaborated to develop the eCoastal GIS to support Regional Sediment Management (RSM) spatial data management and analysis needs. It is designed according to the enterprise GIS policies of the U.S. Army Corps of Engineers (USACE) and provides RSM and other coastal engineering analysis tools and applications. Enterprise GIS (eGIS) is the integrated geospatial technology infrastructure delivering spatial information products, services, and standard datasets to all functional elements and business processes of the organization. eCoastal is scalable, which means that other tools and applications can be developed and added without impacting existing capabilities.

Coastal resources are being integrated into a geographic information system (GIS) to assist in the organization and distribution of spatial information. The Mobile District’s Spatial Data Branch has designed a SDSFIE compliant geodatabase template and a series of comprehensive ArcGIS applications, named eCoastal, to assist the coastal engineer in effective planning and prediction of regional and local coastal processes. The specialized applications were developed to provide baseline information for regions including hydrographic and topographic data, shoreline position, aerial and oblique photography, hyperspectal imagery, dredging records, nautical charts, and other data regarding regional utilities, infrastructure, and land use. Customized GIS applications were also designed to retrieve pertinent hydrologic information, to extract dredging information from district databases via reporting tools, and to create bathymetric profiles and volume changes.

Land Use Planning II

Kensington C

B07. THE INTEGRATION OF N-SPECT WITH THE DEVELOPMENT OF A WATERSHED MANAGEMENT PLAN FOR THE KINGSTON LAKE WATERSHED, SOUTH CAROLINA
Tammie Middleton, Coastal Carolina University, Center for Marine and Wetland Studies
Susan Libes, Coastal Carolina University

In 2005 a community based watershed planning project was initiated for the Kingston Lake Watershed (KLW). The KLW lies in the northwestern corner of Horry County, SC. This study is a multi-agency effort to effectively approach the watershed planning effort from multiple directions. Baseline assessment of the KLW includes a mail survey to gauge perceptions of the environmental quality of the watershed, natural resources, and water quality. Water quality in the KLW is of concern as it is a rapidly developing area. There have been sites within the watershed boundaries listed as impaired on EPA’s 303d list. As a part of the effort to quantify the effects of future development on water quality within the watershed we have chosen to use the N-SPECT tool developed at the NOAA Coastal Services Center. After developing baseline conditions, scenarios to model the effects of build out considering both no development of wetlands and limited wetland development are run. Annualized runoff and storm event scenarios are to be run as well. Model results are expected to show that as development increases in the area, water quality degrades due to an increase in pollutant loads in the streams, especially those located in urban and residentially developed areas. The results of these scenarios will be used to help develop a community based watershed management plan. Results will also be utilized in public outreach to help visualize the potential water quality impacts associated with likely growth scenarios.

B08. DEVELOPMENT OF A DYNAMIC NONPOINT MODEL
Jeffrey Herter, New York State Department of State
Lee Herrington and Horace Shaw, State University of New York, College of Environmental Science and Forestry

In collaboration with SUNY ESF (ESF), NYS Department of State Division of Coastal Resources GIS (Division) developed a pilot dynamic nonpoint pollution model for a watershed on the south shore of Long Island. After a feasibility analysis, ESF recommended the Carmans River watershed as the pilot location. Data for the model include digital elevation models, hydrographic, soils, land use, zoning, topographic maps, land cover and NYS digital orthophotography. ESF used the ArcHydro extension to ArcGIS to delineate the watershed, develop the database of hydrologic data and the hydrologic network. ArcGIS's model builder was used to implement the model based on the Natural Resource Conservation Service's curve number process and Event Mean Concentration values for various pollutants. The model provides a tool that can assist decision makers to evaluate effects of storm event intensity, pollutant loading, development in a watershed and the effects of mitigation.

B09. ASSESSMENT OF ANTHROPOGENIC LANDSCAPE ALTERATIONS IN COASTAL WATERSHEDS FOR A QUALITATIVE MEASURE OF POTENTIAL EROSION CELLS
John Cartwright and David Shaw, GeoResources Institute, Mississippi State University

The implications of the majority of the United States population (52%) living within 25% of the Nation's land area provides emphasis and justification of the need to better understand the impacts of upland watershed alteration to coastal ecosystems and environments. The continuous increase of human populations in sensitive coastal areas is resulting in anthropogenic modifications of upland areas and hydrologic systems leading to environmental degradation of coastal watersheds. The GeoResources Institute at Mississippi State University as part of their role in the Northern Gulf of Mexico Cooperative Institute has established a research effort for modeling sedimentation in Mobile Bay and surrounding sub-basins. Preliminary research efforts are utilizing previous baseline studies of erosion potential within the Weeks Bay watershed on the eastern shore of Mobile Bay. Qualitative assessments of potential upland sources of sediment or erosion cells are being derived based on the combination of current land-use practices, changes in land-use/land-cover, terrain analyses, and physical properties of soils and other geomorphologic features. Additionally, spatial analyses were performed for an impact zone analysis providing erosion regions within the watershed at a sub-basin scale within the area of the Weeks Bay Watershed. Results of this research are being used to further the efforts of modeling sediment sources and fate for Mobile Bay and to aid in the implementation of environmentally sound watershed management practices.

Coastal Hazards II

Kensington F

B10. ESRI'S ARC HYDRO DATA MODEL FOR WATERSHED MANAGEMENT
Louis Wasson, GeoResources Institute, Mississippi State University

ESRI's Arc Hydro data model is an ArcGIS 8.3 and 9.x extension designed for hydrologic applications. Arc Hydro is unique in that it can incorporate NEXRAD radar precipitation estimates. NEXRAD estimates allow managers to see spatially the distribution of rainfall over a watershed, a perspective not possible with surface rain gauges. NEXRAD data is useful but its xmrg format is not user friendly and difficult to incorporate into ArcGIS. Through cooperation among several organizations a NEXRAD Web Service has been developed that processes the

NEXRAD data into Arc Hydro time series format for any location in the country. Arc Hydro also develops relationships between rivers, streams, stream gauges, and rainfall thru a relational database. This network of relationships is helpful in understanding movement of water thru a watershed to its outlet. Much of the water flowing from the outlet point will eventually end up at the coast directly impacting sensitive coastal estuarine and commercial environments as well as recreation and tourist industries. Data derived from running Arc Hydro can also be coupled into flood plain simulation models like HEC HMS and HEC-RAS. This integration of models helps managers and decision makers in planning operations.

B11. USING ARCENGINE TO BUILD DECISION SUPPORT TOOLS FOR TSUNAMI EMERGENCY MANAGEMENT, MODELING AND PLANNING
Nazila Merati, Chris Chamberlin, David Ford, and Christopher Moore, NOAA Pacific Marine Environmental Lab

The use of GIS for planning, emergency management and modeling typically uses desktop GIS, which serves well for analysis and mapping. However, it can be costly, complicated, and with a large learning curve that makes its use daunting for the average user. ESRI's ArcEngine allows programmers to build custom ArcGIS applications for specific applications that reduces the learning curve, targets a specific market, and simplifies the deployment to many users in the field or office. It may prove to be useful and less costly for hazard mitigation and response situations. NOAA's Center for Tsunami Research and NOAA's Coastal Data Development Center have created an application to assess the impact of tsunami hazards in coastal communities for the United States and Pacific Territories using ArcEngine that allows the user to modify the inputs to determine the impact from different scenarios using a combination of Standing Inundation Model (SIM) results, census information, bathymetry/topography, community infrastructure with the option of adding more data as the user needs change. We will explore the relative merits of the ArcEngine application versus using a web-based ArcGIS Server solution for decision support.

B12. SHELLFISH HARVEST AREA CLOSURE DECISION MAKING USING PREDICTIVE MODELS
Heath Kelsey, JHT Incorporated at the NOAA Center for Coastal Environmental Health and Biomolecular Research
Geoffery I. Scott, NOAA Center for Coastal Environmental Health and Biomolecular Research
Dwayne E. Porter, Baruch Institute for Marine and Coastal Sciences and Department of Environmental Health Sciences Arnold School of Public Health, University of South Carolina
Charles Newell, South Carolina Department of Health and Environmental Control, Shellfish Sanitation Section

Statistical models were developed in four South Carolina estuaries to evaluate their potential utility in regulation of shellfish harvest area closures. Models were developed to predict exceedence of a trial bacterial concentration criterion, using four years of fecal coliform concentration and environmental data. Current closure decisions are based on exceedence of precipitation thresholds measured at rain gauges, which can be some distance from harvest area watersheds. The relationship between these precipitation estimates and fecal coliform concentrations is unclear, and regulators are interested in developing improved decision-making support tools through predictive models. In previous research, it was hypothesized that spatially averaged precipitation values derived from remote sensing data (NEXRAD) could provide more accurate estimates in local watersheds. Models were developed using both these and current precipitation estimates to evaluate their comparative utility. Resultant models explained between 78 and 85% of the variability of median fecal coliform concentration. Model validation was evaluated using an additional year of historical data withheld from model development. Average Rates of Correct Classification (ARCC) of trial criterion exceedence ranged from 85% to 98%, with the highest ARCC value occurring for the regression model incorporating

NEXRAD precipitation data and salinity. This study suggests that improved predictive models can be developed by incorporating remotely sensed precipitation data, and that these models may be useful in the support of shellfish harvest area closure decision making. Results from this study have implications for the future development of forecast models for shellfish harvest area management and beach water quality advisories.

Break

3:00 to 3:30 p.m.

Late Afternoon Sessions

3:30 to 5:00 p.m.

Habitat Mapping I

Kensington A

C01. COMPARING DIGITAL & ANALOGUE IMAGERY FOR MAPPING SAV IN SW FLORIDA
Gary Florence, Photo Science Inc.

The Southwest Florida Water Management District is responsible for the protection and management of natural systems and water quality within its geographic boundaries. The agency actively evaluates the ecological health of coastal ecosystems by inventorying and monitoring submerged aquatic vegetation (SAV) communities to determine and improve overall water quality in coastal waters.

To help determine the status and trends of SAV resources two spatially and thematically accurate ArcGIS databases were produced from airborne imagery for the near shore coastal areas. A 2004 SAV dataset was compiled from traditional analogue aerial film which was subsequently updated in 2006 using direct digital aerial imagery. True color imagery of the project area for both 2004 and 2006 were acquired using Airborne Global Positioning System (ABGPS) and an Applanix Inertial Measurement Unit (IMU). The 2004 imagery was captured by the LMK 2000 analogue camera and was scanned and orthorectified. The 2006 imagery was captured by the Zeiss/Intergraph (Z/I) Digital Mapping Camera (DMC) and orthorectified. All feature extraction was accomplished using softcopy photogrammetric techniques combined with field verification. The horizontal positional accuracy of all SAV linework met National Map Accuracy Standards for 1:12,000 scale. The Minimum mapping unit was 0.5 acres and the overall thematic classification accuracy was 90% or greater.

This presentation will compare and contrast the analogue film with direct digital imagery as applied to production work flow, positional accuracy, radiometric accuracy, overall interpretability and to promote discussion for developing a new baseline for SAV features in southwest Florida using direct digital imagery.

C02. COASTAL MARSH INVENTORY FOR THE CRITICAL AREA OF SOUTH CAROLINA'S COASTAL COUNTIES
Matthew Pendleton, South Carolina Department of Health and Environmental Control, Ocean and Coastal Resource Management

This study was conducted to quantify and delineate the coastal marshes of South Carolina, and takes advantage of new technologies to provide greatly improved levels of detail and accuracy over previous estimates. The coastal marsh inventory is part of a larger effort by OCRM to map features throughout the regulatory "Critical Area", defined as all tidelands, coastal waters, beaches and oceanfront sand dune systems. The "Critical Area" is comprised of 1,106,909 acres of land within the eight coastal counties of South Carolina. The marsh inventory was conducted using multi-spectral high resolution aerial photography, fieldwork with a Geographic Positioning System (GPS), and specialized remote sensing and Geographic Information System (GIS) software to extract coastal marshes. Coastal marshes were further delineated into low and high marsh based on several parameters. The resulting coastal marsh data layers will provide a way to monitor and assess the status of coastal marsh systems of the South Carolina coast, and will allow planners, legislators, coastal resource managers and developers to better manage South Carolina's coastal marshes.

C03. USING THE NATIONAL WETLANDS INVENTORY DATA TO IDENTIFY THE MARINE COMPONENT OF A COASTAL NATIONAL WILDLIFE REFUGE
Douglas Vandegraft, U.S. Fish & Wildlife Service

Of the 547 National Wildlife Refuges in the U.S., there are 169 that have a marine component. Many of these refuges are located along a coastline, but are comprised of mostly upland acres. Other refuges extend miles offshore and include many acres of submerged land and water. The Cartographers of the U.S. Fish and Wildlife Service have begun using the digital data from the National Wetlands Inventory to help identify the actual marine component of a refuge in terms of acreage and linear distance. The wetland areas within the refuge boundary that have been classified as marine and/or estuarine are "clipped" with the refuge boundary to produce new polygons. This method has been used successfully for the refuges in the southeastern U.S. and will be used for all of the remaining marine refuges.

Coastal Mapping: Topo/Bathy

Kensington B

C04. A REVIEW AND CURRENT STATUS OF VDATUM, A VERTICAL DATUM TRANSFORMATION TOOL
Edward Myers, Kurt Hess, Zhizhang Yang, Adeline Wong, Jason Woolard, Stephen White, and Bang Le, NOAA National Geodetic Survey
Stephen Gill and Gerald Hovis, NOAA Center for Operational Oceanographic Products and Services

VDatum is a software tool developed by the National Ocean Service that allows users to transform geospatial data among a variety of geoidal, ellipsoidal, and tidal vertical datums. This is important to coastal applications that rely on vertical accuracy in bathymetric, topographic, and coastline data sets. The VDatum software can be applied to a single point location or to a batch data file. Applying VDatum to an entire data set can be particularly useful when merging multiple data sources together, where they must first all be referenced to a common vertical datum. Emerging technologies, such as lidar and kinematic GPS data collection, can also benefit from VDatum in providing new approaches for efficiently processing shoreline and bathymetric

data with accurate vertical referencing. VDatum is currently available for Tampa Bay, New York Bight, Delaware Bay, Louisiana's Calcasieu River and Lake Charles, central California, Puget Sound, Strait of Juan de Fuca, North Carolina and Chesapeake Bay. Development is currently in progress for Mobile Bay to Cape San Blas, southern California, Long Island Sound and New York Harbor, and projects are also commencing for an area from New Orleans to Mobile Bay, the Gulf of Maine and the Pacific Northwest. Given the numerous applications that can benefit from having a vertical datum transformation tool, the goal is to develop a seamless nationwide VDatum utility that would facilitate more effective sharing of vertical data and also complement a vision of linking such data through national elevation and shoreline databases.

C05. THE MAPCOAST PARTNERSHIP: BATHYMETRIC MAPPING IN SHALLOW COASTAL ENVIRONMENTS: INTEGRATING FATHOMETRY, GPS, AND GIS
Mike Bradley, University of Rhode Island
Kathyrn Ford, Massachusetts Division of Marine Fisheries
Peter August, University of Rhode Island
Emily Shumchenia, University of Rhode Island, Graduate School of Oceanography

Detailed and accurate elevation and bathymetry data are non-existent for coastal marshes, dunes, inter-tidal flats, and shallow-subtidal habitats (<5m) in Rhode Island. One of the major goals of the MapCoast Partnership is to develop and disseminate high resolution, accurate, and seamless digital terrain models (topography and bathymetry) above and below the sea surface (to +/- 5m depth) in coastal environments. Detailed topography/bathymetry was one of the most requested datasets in a user needs survey the MapCoast project conducted in 2003. Using data from fathometers, RTK (Real-time kinematic) GPS, and LiDAR, digital elevation models (DEM;1.5m x 1.5m cell size) were created using GIS interpolation methods. For this talk, we will present methods, protocols, interpolation techniques, and validation methods we used to create bathy/topo DEM's for two shallow-water lagoonal systems in coastal Rhode Island.

C06. TERRAIN DATA INTEGRATION FOR COASTAL FLOOD ANALYSES IN COASTAL MISSISSIPPI
Karen Schuckman, URS Corporation
Kevin Slover, Dewberry and Davis
Shabbar Saifee, Federal Emergency Management Agency

Following the 2005 hurricane season, FEMA contracted for new coastal analyses and floodplain mapping along the Gulf Coasts of Hancock, Harrison, and Jackson counties in Mississippi. Topographic and bathymetric data were required for the storm surge modeling, wave height analysis, and flood hazard mapping component of these analyses. All of the topographic and bathymetric data used to develop the seamless surface model were obtained from pre-existing, publicly available sources; no new datasets were created. The methodology used to assure the quality of the input datasets and the techniques used to merge the pre and post hurricane lidar datasets into a seamless topographic coverage is described in this presentation. The resulting topographic data was then merged with bathymetric data to build a seamless topo/bathy grid for ADCIRC storm surge modeling. Resolution of the difference in vertical datums (NAVD88 for the topographic data and MSL for the bathymetric data) was accomplished used tide gauge observations. Techniques used for building the ADCIRC grid will also be discussed in this presentation. The seamless topo-bathy dataset created for the Mississippi Gulf Coast flood analysis project is now available through FEMA and the NOAA Coastal Services Center LDART website. This presentation provides valuable information for potential users of this dataset, as well as for others who may be interested in building similar seamless datasets in other coastal regions.

Tools for Ecosystem-Based Management I

Kensington C

C07. SOFTWARE TOOLS FOR ECOSYSTEM-BASED MANAGEMENT
Sarah Carr and Patrick Crist, NatureServe

A wide variety of software tools have been developed to help policymakers and managers plan for and implement ecosystem-based management (EBM) in coastal and marine environments. For example, existing EBM tools can predict ecosystem response to natural disturbances in watersheds and the marine environment; select optimal areas for conservation or restoration; help managers and stakeholders visualize the impact of development and resource-use scenarios on an ecosystem; collect local knowledge about a resource; and facilitate stakeholder voting on management alternatives. Navigating through the vast array of tools and figuring out the best tools for an EBM project can consume a great deal of time, however. We will provide information on the range of EBM tools and the functionality of a small set of "priority" tools that appear to be most useful for common EBM tasks. We will also describe a new on-line resource (*www.ebmtools.org*) for selecting tools that are most appropriate for EBM planning and implementation projects and provide information on upcoming EBM tool training opportunities.

C08. MOVING MARINE ECOSYSTEM-BASED MANAGEMENT FORWARD: GEOSPATIAL TOOL INTEROPERABILITY, STANDARDS AND PROTOCOLS
Patrick Halpin, Jason Roberts, and Benjamin Best, Duke University
Kristin Barker, NatureServe

Implementation of new Marine Ecosystem-Based Management approaches (M-EBM) will require extensive innovation in the development of novel analytical and decision support tools spanning a wide range of disciplines and practitioners. The future of M-EBM demands more detailed analytical capabilities in the areas of dynamic oceanographic analysis, connectivity analysis, multi-dimensional habitat modeling, spatio-temporal representations of food-webs; as well as more sophisticated approaches to integrating human interactions (e.g. fishing pressure displacement, species bycatch, economic valuation, and links to socio-economic models). Successful implementation of M-EBM practices will require a diverse toolbox of novel, interoperable and freely exchanged tools for the marine resource management and conservation community. Work flows for providing this information must be supported by: (1) tools to process and synthesize oceanographic, socio-economic and biological data; (2) tools to develop statistical and ecological models that convert that data into useful information; (3) decision support tools for managers and stakeholders; and (4) tools to evaluate and monitor ecosystem responses. Analytical and decision support tools developed for M-EBM applications should be freely shared, reusable, interoperable, modular, open-source, standards-based and fully documented products. To move tool development forward, a consortium of M-EBM tool developers has recently been formed and has been developing a draft synopsis of interoperability standards and protocols to help guide collaborative development in this area. In this presentation, we outline the emerging standards and protocols for marine geospatial data processing and tool development to support Marine Ecosystem-Based Management and coastal management applications.

C09. ECOGIS – DEMONSTRATION OF GIS TOOLS FOR ECOSYSTEM-BASED FISHERIES MANAGEMENT
David Moe Nelson and Eric Finnen, NOAA National Centers for Coastal and Ocean Science
Tim Haverland, NOAA Office of Science & Technology

EcoGIS, a collaborative project between NOAA Fisheries, NOAA's Ocean Service, and the four fishery management councils for the Atlantic and Gulf of Mexico, has developed a set of GIS tools to better enable both fisheries scientists and managers to adopt ecosystem approaches to fisheries management. We will present models and live demonstrations of the ArcGIS tools to address four high-priority functional areas: general ecosystem characterization, commercial fishery effort mapping, bycatch analysis, and quantification of interactions between fishing gear and bottom habitat. These tools are developed as an extension for ArcGIS 9.x, and generate spatial and temporal analyses using specified criteria from a variety of data sources, including base map layers, commercial fishery observations and vessel trip reports.

Data Sharing I

Kensington F

C10. THE MASSACHUSETTS OCEAN RESOURCE INFORMATION SYSTEM – AN ONLINE OPEN SOURCE MAPPING TOOL
Daniel Sampson, Massachusetts Office of Coastal Zone Management

MORIS, the Massachusetts Ocean Resource Information System is an open source online data mapping tool created by MassGIS (the Massachusetts Office of Geographic and Environmental Information) and the Massachusetts Office of Coastal Zone Management. MORIS allows users to quickly create maps of Massachusetts, navigate around the state, and download the actual data that is being viewed. At its essence, MORIS is a comprehensive database providing access to a broad range of Massachusetts related coastal and oceanic spatial data. To aid discoverability, all MORIS data have XML-based FGDC-compliant metadata that have been registered with NASA Global Change Master Directory. In addition to basic mapping functions, MORIS can find locations via entry of street addresses or zip codes, generate and bookmark map URLs, convert maps to graphics, and save and print maps. MORIS also includes an extended identify tool that allows users to access linked data such as documents or photographs, and a georegulations tool that shows the boundaries of jurisdictional areas relevant to aquaculture and related coastal activities while concurrently providing summaries of applicable state and federal regulations. Vector data layers can be clipped to a user-defined extent and downloaded in the industry-standard ESRI Shapefile format. MORIS utilizes web mapping services (WMS) to dynamically integrate multiple distributed on-line data sources into one or several map images. Vector data are served via the new open source GeoServer application while raster based data are served via ArcIMS. (GeoServer does not yet support raster). All MORIS source code is available for download from MassGIS.

C11. GREAT LAKES CIRCLE TOUR COASTAL ACCESS GUIDE: USING WEB MAPPING TO SUPPORT COASTAL CULTURAL TOURISM
David Hart, University of Wisconsin, Sea Grant Institute
Matthew Purdy, Jennifer Zeisloft, and Stephen Ventura, University of Wisconsin

This presentation describes the development of interactive web mapping applications to integrate marine heritage tourism attractions with the Great Lakes Circle Tour route and provide detailed information about public access to the Great Lakes coast. The purpose of the Great Lakes Circle Tour Coastal Access Guide (*http://maps.aqua.wisc.edu/glct/*) is to direct travelers off the heavily-traveled state and federal highways of the primary circle tour route and towards the many coastal access sites and cultural tourism resources located on the downtown streets and rural roads that hug the lakes. Applications developed in Google Earth and the open-source MapServer software provide both a land-side and water-side perspective to the Wisconsin segments of the Lake Michigan and Lake Superior Circle Tour. Map layers include the primary circle tour route, local roads, parks, beaches, recreational trails, historical markers, lighthouses, boat launches, and shipwrecks. Panorama photos that synchronize the field of view with an associated vicinity map were taken for every public access site to the Great Lakes in Wisconsin. The web mapping applications provide the capability to link to external web content about Great Lakes sites maintained by the custodians of those features. Examples include links to information about shipwrecks, historic markers, lighthouses, museums, and parks from the Wisconsin Maritime Trails web site maintained by the Wisconsin Historical Society and beach information and conditions from the Wisconsin Beach Health site.

C12. IMPLEMENTATION OF A GAZETTEER FOR THE COAST
Carsten Heidmann, BAW Hamburg
Jörn Kohlus, National Parks Tönning, DEU

The usage of a common vocabulary is one of the necessities for cooperation in every working area. Thesauri can provide a part of this infrastructure, but they lack the ability to describe spatial terms. Digital Gazetteers provide a possibility to assign place names with geometry information. The concept of gazetteers is already rather old and has evolved from a mere directory of place names to a possibility to describe spatial ontologies. Digital gazetteers combine information about an object's spatial and temporal extent, its name, its feature type, and its relations to other spatial objects.

A gazetteer for the coast has to meet special requirements. The coastline rather often is a place where different cultural and lingual influences interfere with each other, resulting in a multiplicity of names. Also, coastlines often have features which alter their spatial extent in relatively short time, which cease to exist or which appear or even re-appear. The authors will present the implementation of a digital gazetteer for the German coast, which is created in the research project NOKIS++, funded by the German Ministry for Education and Research. The German coast offers all the discussed challenges. The largest part of the German North Sea Coast is comprised of tidal flats with rapid changing features. The presence of minority languages and the constantly changing ownership of wide stretches of the coast in the last centuries have resulted in a great variety of place names.

Wednesday, March 7

Early Morning Sessions

8:30 to 10:00 a.m.

Habitat Mapping II

Kensington A

D01. MAPPING BENTHIC HABITATS FROM ADS40 DIGITAL AIRBORNE IMAGERY USING OBJECT ORIENTED ANALYSIS
Chad Lopez, EarthData International
Kass Green, The Alta Vista Company
Bill Stevenson, Perot Systems Government Services at the NOAA Coastal Services Center
Dan Bubser, Avineon Inc.
John Wood, Harte Research Institute, Texas A&M University–Corpus Christi
Jim Simons, Coastal Fisheries Division, Texas Parks and Wildlife
Keith Patterson, Avineon Inc.

The state of Texas recently adopted a Seagrass Monitoring Program that calls for the mapping of seagrass beds along the Texas coast to assess status and trends. The NOAA Coastal Services Center (NOAA CSC) is working cooperatively with the Texas A&M University-Corpus Christi Center for Coastal Studies and the Coastal Fisheries Division of the Texas Parks and Wildlife Department to develop benthic habitat data to support this need. The NOAA CSC chose EarthData International and its partners, The Alta Vista Company and Avineon, Inc. to map benthic habitats, primarily seagrass beds, along the coastal bend of Texas using ADS40 digital airborne imagery. Multiple object oriented mapping methods, including Feature Analyst class-by-class extraction, Feature Analyst unsupervised and Classification and Regression Tree (CART) Analysis, and Definiens Professional and CART analysis, were evaluated for a small pilot region in Redfish Bay, Texas. Accuracy assessment was performed for each method. Based on the pilot results, the method of image segmentation using Definiens Professional and classification through CART analysis was chosen for the full project area. Training sites in the form of polygons were collected both in the field and in the office through photointerpretation. A random selection of sites for each class was chosen for accuracy assessment and the remaining sites were used as signature training sites for CART analysis. Labeling rules for each class, created through CART analysis, were used to label every polygon across the entire project area. This paper presents the most recent results of this ongoing mapping project.

D02. MAPPING SALT MARSH VEGETATION USING HIGH RESOLUTION AIRBORNE DIGITAL CAMERA IMAGERY
Michael Rasser and Kenneth H. Dunton, University of Texas, Marine Science Institute

High resolution mapping of coastal vegetation has traditionally been conducted utilizing photographs from standard large format aerial cameras. In recent years the emergence of new digital remote sensors has proved to be an excellent alternative to the use of film-based aerial photography. These sensors offer several advantages over standard aerial photography, including a completely digital workflow and superior radiometric resolution. However, new processing methods are needed to realize the potential of this imagery in monitoring coastal vegetation. As part of a cooperative monitoring project with the City of Corpus Christi , we utilized Z/I Digital Mapping Camera (DMC) imagery to map the distribution of emergent vegetation in

the Nueces River salt marsh near Corpus Christi, Texas. An automated classification method was developed using the color infrared imagery of the DMC. Texture measures and vegetation indices were utilized to increase the information content of the imagery. The processing methods developed in this study should prove useful to coastal land managers utilizing high resolution remote digital camera imagery to monitor coastal vegetation.

D03. Pending

Coastal Mapping: Decision Support Tools

Kensington B

D04. USING INTERNET MAPPING TO SHARE CHESAPEAKE BAY SAV MONITORING RESULTS
David Wilcox, Anna K. Kenne, and Robert J. Orth, Virginia Institute of Marine Science

Submerged Aquatic Vegetation (SAV) is one of the key indicators used to assess the health of the Chesapeake Bay ecosystem and to help evaluate the effectiveness of management practices. Distribution and abundance of SAV in the Bay and tributaries has been assessed annually since 1984, providing 22 years of data. This unparalleled long-term SAV dataset has been distributed in many formats, starting with printed reports, moving to a static website, and is currently available on a dynamic map server. This dynamic map server is based on a system that pairs ESRI GIS Server technology with Microsoft ASP.Net web server objects to create a seamless website. Dynamic mapping tools permit the web user to select which data layers to display and, where available, can inspect the detailed source imagery. In addition to the maps, all tables and charts on the site are dynamically generated directly from the most recent data, providing access to custom analyses that were not available in the static reports. Since the entire site is managed through Microsoft Windows .Net objects, it is fairly easy to enable the different parts of the website to interact, permitting users to directly enter field observations and photos while referencing map locations, comments, and other elements on the site. The SAV map and data server provides easy access to a large amount of data, facilitates data acquisition, and provides a method for distributing new data earlier than has been possible in the past.

D05. ARCIMS FOR LAND USE PLANNING IN AMERICAN SAMOA
Paul Anderson and Tali Tuinei, American Samoa Coastal Zone Management Program

The American Samoa Department of Commerce has implemented a planning strategy that incorporates the use of ESRI's ArcIMS for resource management and hazard mitigation. The Tutuila Hazards Assessment Tool (T-HAT) website is used to identify and assess locations being considered for the Project Notification and Review System (PNRS) permits. PNRS is the land use permitting process for the Territory of American Samoa. Land use changes including development, construction, and modification of land require an individual to submit an application for a land use permit to American Samoa Coastal Management Program (ASCMP). A Conservation Resource Officer (CRO) then accesses the ArcIMS site to investigate the proposed site. In the first 18 months of operation the site has been used to review over 1000 permit applications. Information derived from the ArcIMS site includes GIS data layers for environmental hazards such as flooding, landslides, and earthquakes. T-HAT has recently been updated to include current roads, buildings, and flood zone maps and now uses the standard NOAA coastal services center template. This easy to use, lightweight internet mapping application also produces effective visualizations used to educate the public regarding the vulnerability of development projects to particular hazards. The final map showing the location of the proposed

site and surrounding landscape hazards is created using a layout created within ArcIMS. The tool was developed as the result of a partnership between the American Samoa Coastal Management Program and the National Oceanic and Atmospheric Administration's (NOAA) Pacific Services Center and Coastal Services Center.

D06. SCENARIO-BASED DECISION SUPPORT SYSTEM FOR FISHERIES CONSERVATION IN THE GULF OF MEXICO
Aaron Racicot, Charles Steinback, and Mike Mertens, Ecotrust

In collaboration with The Ocean Conservancy, we developed a web based decision support tool to address the need to visualize results of different approaches to fisheries management in the Gulf of Mexico. The tool informs fishery managers, scientists, policy-makers by allowing them to evaluate scenarios and answer questions driven by area-based management and recent natural phenomena (hurricanes). We used data to link the fishing footprint of selected fleets to coastal communities in a spatially explicit manner. The user can compare both the shore-side and at-sea effects of areas closed to fishing by querying known spatial, thematic, and temporal variables separately or in addition to spatial features (e.g., interactively defined areas of interest, or known features like bycatch hotspots or certain ranges of depth). The user can also evaluate the perceived impacts of recent hurricanes to the commercial shrimp fishery by removing portions of the fleet from affected areas and compare where effort has been displaced or shifted. Those areas can be evaluated further using biological and physical data like those developed through the Gulf of Mexico Essential Fish Habitat process. Results from scenarios are summarized in a reporting fashion and presented as maps, tables, and graphs.

Tools for Ecosystem-Based Management II

Kensington C

D07. MARZONE AND ITS APPLICATION TO CALIFORNIA'S MARINE LIFE PROTECTION ACT INITIATIVE
Charles Steinback, Aaron Racicot, Mike Mertens, and Astrid Scholz, Ecotrust
Matthew Watts, Carissa Klein, and Hugh Possingham, University of Queensland

Working in collaboration, Ecotrust, the University of Queensland, and the University of California have developed components for a spatially explicit tool that will allow science-advisors to design and evaluate the performance of Marine Protected Area (MPA) networks in the context of the California Marine Life Protection Act (MLPA). In 2005, the state's Department of Fish and Game created an Initiative to implement a network of MPAs inside state waters based on the best available science. This Initiative was first implemented in the Central Coast of California, between Pigeon Point and Point Conception, and will continue to the north and south coasts through 2010. Based on the MPA design criteria and the biological, physical, and socio-economic goals identified in the Central Coast region, it became apparent that there was need for a decision support system (DSS) that would integrate such objectives and better inform the process. We've attempted to address this integrated approach, informed with lessons learned from previous MARXAN applications to MPA design, specifically regarding the MLPA Initiative. Doing so, we've modified the existing functionality of MARXAN, titled MarZone, which allows for the designation of multiple zone types (e.g. marine reserves, marine parks, marine conservation areas, multiple use zones), multiple costs (e.g. fishing, enforcement, spatial), and ecological connectivity between a network of MPAs. Additionally, these modifications have been designed and integrated into a DSS that will aid MLPA staff and advisors in efficiently designing and evaluating a network of MPAs pursuant to the goals of the MLPA.

D08. TOOLS AND APPROACHES TO ACCOUNTING FOR HAZARD MITIGATION AND NATURAL RESOURCE PLANNING IN AN ECOSYSTEM-BASED MANAGEMENT (EBM) FRAMEWORK: COMMUNITY VULNERABILITY ASSESSMENT TOOL (CVAT) & MARXAN DECISION SUPPORT TOOL INTEROPERABILITY
Chris Shepard, University of Santa Cruz
Rafa Calderon, The Nature Conservancy
Dan Dorfman, Intelligent Marine Planning
Mike Beck, The Nature Conservancy

To achieve better ecosystem approaches we must be able to account for multiple objectives simultaneously and this has been difficult to do in a transparent and adaptive framework. We illustrate how to simultaneously account for hazard reduction and biodiversity conservation objectives. Natural hazards cost the U.S. roughly $50 billion annually and the cost of damages in the state of Louisiana from Hurricane Katrina alone have already been assessed at over $39 billion. We present an ecosystem-based approach to the analysis of risks from coastal storms, assessment of community vulnerability, and consideration of the mitigation value provided by functioning ecosystems. We use the Community Vulnerability Assessment Tool (CVAT) to identify areas of hazard risk and community vulnerability. We then identify saltmarshes, seagrass beds, and oyster reefs which have the potential to provide mitigation services for places at risk. After identifying areas with potential mitigation value, we use this information within a regional ecosystem assessment framework which enables us to establish priority areas for advancing both ecosystem conservation and hazard mitigation values. We anticipate being able to add management for hazard mitigation values to operations in places which are currently managed for natural resource values. In communities which undertake planning for natural hazards, these tools can help to support the development of mitigation actions which focus on integrating the services provided by functioning ecosystems.

D09. SPATIAL SOCIOECONOMIC TOOLS: A REVIEW AND RECOMMENDATIONS
Miranda Smith, Duke University

Ecosystem-based management (EBM) of coastal and marine environment requires consideration of social and economic factors, as well as, the natural environment. It is especially important to incorporate socioeconomic factors in coastal and marine areas because the benefits and costs of conservation are widely distributed throughout the economy and dispersed over a large geographic region. I reviewed the scientific literature and existing spatial models to find key advancements in developing spatial socioeconomic tools useful for coastal-marine ecosystem-based management. I found that many existing spatial tools integrate socioeconomics but are site-specific and biased on what is valued by local markets only. The focus of existing tools is to maximize total biodiversity at a minimum cost within a chosen site. Few models aim to capture trade-offs between the opportunity costs of conservation and the marginal utility of biodiversity. From my review of the existing literature and tools, I have prioritized ways of improving the functionality of spatial socio-economic tools, including 1) incorporating methodologies to assess non-use ecosystem values, 2) utilizing a dynamic optimization framework, and 3) clarifying connectivity issues. The objective of this review and recommendations for the next step in tool development are to spur improved integration of socioeconomic factors and models into spatially-based decisionmaking.

Coastal Hazards: Inundation

Kensington F

D10. MODELING FLOOD EXTENT ON COASTAL PLAIN USING A HYDRAULIC MODEL: A SIMPLE ALTERNATIVE TO THE STANDARD HEC-RAS MODEL
Yong Wang, East Carolina University
Tao Zheng, University of Maryland

A hydraulic DEM-inundation model has been developed as a tool for flood extent mapping on coastal floodplain. The model is intended to be a simple alternative to the well-known standard HEC-RAS model while maintaining comparable accuracy. The validity and accuracy of the model have been assessed by the comparison of the modeled results from the DEM-inundation and HEC-RAS models: the modeled flood extents were very similar, and by the verification against the September 1999 flood on the Tar/Pamlico River floodplain, North Carolina: the overall accuracy on inundation was greater than 93%. Therefore, the DEM-inundation model is valid and reaches accuracy close to that of the HEC-RAS model on coastal floodplain. There are, however, three cautions. The DEM-inundation may not be capable of mapping an inundation extent for a large river basin, especially where major tributaries are involved and the surface water heights of the tributaries are unknown. Second, the DEM-inundation model assumes that water surface heights decrease downstream depending only on the distance and elevation variables along the river's central channel. Other factors, such as the river channel's width, have been ignored. Finally, the DEM-inundation model assumes the water height at an off-centerline location is equal to the water height at the on-centerline location that has the shortest distance between the two locations. This assumption ignores the local low or high elevation factor, which could force the water area extent in off-straight line directions.

D11. MAPPING COASTAL FLOOD ZONES WITH THE WISE COASTAL MODULE
Cheryl Johnson and Ki Hong Pak, Watershed Concepts

Accurate and current coastal flood risk information is an important component of FEMA's Map Modernization Program and has moved to the forefront of attention after recent tsunami and hurricane disasters. This presentation will describe the new Coastal Module that Watershed Concepts has developed for the Watershed Information System (WISE) ® software package that greatly simplifies FEMA coastal flood studies while improving their reliability and accuracy. A key feature of the Coastal Module is its ability to automate the process of creating shoreline transects and managing these data. Transects can be placed at user-specified intervals and transect elevations can be readily extracted from underlying terrain data such as LIDAR. The Coastal Module also automates the revision of transect profiles to account for storm erosion and gives the user tools to identify primary frontal dune features which control VE Zone mapping. The Graphical Transect Editor within the module provides synchronized side-by-side plan, elevation and data views along a transect allowing efficient editing of transect data. The Coastal Module is integrated with current Geographic Information Systems technology, and is intended to improve the efficiency of producing coastal Flood Insurance Studies. Ongoing case studies will be presented, highlighting the improvements the Coastal Module offers in the areas of efficiency, consistency, accuracy, quality control, and archiving.

D12. HURRICANE KATRINA – THE AFTERMATH: AN OPEN SOURCE WEB MAPPING APPLICATION
Alan Lulloff, Association of State Floodplain Managers

The Association of State Floodplain Managers (ASFPM), in partnership with the University of Wisconsin State Cartographer's Office (SCO), has developed an online mapping tool for exploration of geospatial data related to Hurricane Katrina. The initial focus of this internet map is to provide map-based information to help floodplain managers and communities explore data released about Katrina as they work to recover from this disaster. This application is an example of how open source technology can be used for outreach and education. Much information has been generated regarding the extent of the storm surge and flood heights that occurred. However, data often are not effectively combined to meet decision making needs. For example, web sites may portray the extent of inundation from Katrina but not indicate the locations of the levees and the levee breaches. This application attempts to provide a single source for this type of information in an easy to use, exploratory interface. The application includes:

- FEMA Flood Insurance Rate Map (FIRM) boundaries,
- Advisory Base Flood Elevation (ABFE) boundaries,
- the extent of the coast inundated by the Katrina storm surge,
- the location of levees and the breaches,
- and aerial photography from before and after the storm.

The application allows users to explore the data manual as well as by focusing on a city or address of interest. It also features a user interface for adding custom data to the map, such as local photography.

Break

10:00 to 10:30 a.m.

Late Morning Sessions

10:30 a.m. to 12:00 p.m.

Remote Sensing III

Kensington A

E01. REAL-TIME MAPPING OF COASTAL AND ESTUARINE WATER QUALITY
T. Mark Trice and Bruce Michael, Maryland Department of Natural Resources
Paul Barter, Cawthron Institute
Walter Boynton, University of Maryland Chesapeake Biological Laboratory

The collection of high frequency spatial estuarine and coastal water quality data is becoming commonplace throughout the world with the concurrent technological developments in water quality datasondes, micro-computing technology, and global positioning (GPS) and geographic information systems (GIS). Many research and environmental management organizations employ underway monitoring systems aboard small boats which collect geographically referenced water quality data on the order of seconds. These systems have been limited by their graphical user interfaces which usually only consist of numerical, chart or gauge-based displays.

To improve the utility of these hardware systems, the Maryland Department of Natural Resources, with assistance from a CICEET grant, and cooperation with the New Zealand-based Cawthron Institute and the Towson University Center for GIS, has developed a real-time water quality GIS interface called DATAVIEW. DATAVIEW enhances research and monitoring by providing spatial data visualization, navigational aids, data alert systems, metadata entry tools, adaptive sampling capabilities and real-time analysis in the field. The software employs custom Visual Basic

software modules within ESRI ArcMap. DATAVIEW will provide managers with enhanced abilities to investigate the linkages between water quality and habitat which will ultimately aid watershed restoration efforts. The software will improve adherence to sample design, adaptive sampling and metadata collection, providing better quality spatial data for regulatory assessments. DATAVIEW's modular design ensures that future functionality can be developed as management needs change. A review of DATAVIEW's functionality and select case studies will be presented.

E02. BIOGEO'S SAMPLING TOOL FOR GIS
Eric Finnen and Charles Menza, NOAA National Centers for Coastal and Ocean Science

A vast array of sampling designs can be used to assess the condition of biological populations, but not all designs are equal. The choice of which design to use depends on sampling objectives, cost, expertise, and available data. BioGeo's Sampling Tool provides a simple way for researchers and park managers to evaluate the costs and benefits of choosing distinct sampling designs within ArcGIS. This approach can also be used quite easily for monitoring in Marine Protected Areas. Two design performance measures are central to comparisons: estimated sample size to achieve a sampling objective and sampling precision (or standard error). From sample data, the tool allows users to estimate population means and totals, sampling precision, strata means and standard errors, and apply the finite population correction. Samples are area-based and selected from either a user-defined sampling frame or randomly within a user-defined sampling space. Simple random sampling, stratified random sampling, and two-stage sampling can be performed. Case studies are presented.

E03. HABITAT AND CONNECTIVITY ARCGIS TOOLBOXES (HABITATTOOLBOX AND CONNECTIVITYTOOLBOX) FOR MULTIVARIATE REGRESSION AND GRAPH-THEORETIC MARINE APPLICATIONS
Benjamin Best and Pat Halpin, Duke University

Quantifying habitat and connectivity are core functions to a multitude of applications in marine ecology and conservation biology, such as marine reserve design and ecosystem-based management. The most current and sophisticated tools for these analysis have not been readily available to ArcGIS users. Here we describe new tools which bridge cutting-edge software for these purposes. The HabitatTools utilize the open-source R statistics package to carry out several multivariate regression techniques for quantifying habitat: generalized linear models (GLM), generalized additive models (GAM), and classification and regression trees (CART). Use of receiver-operator curves (ROC) enables optimal creation of habitat patches from logistic habitat surfaces based on minimizing cross-validation error. The ConnectivityTools can then apply a cost surface to these patches for creation of a network using a novel TIN approach. Graph-theoretic algorithms are then available for calculating least-cost paths between all patches, restricting networks based on dispersal distances, and graph metrics such as degree and betweenness. The graph-theoretic functions are provided by the Python programming package NetworkX. All code is open-source and made accessible via an ArcCatalog toolbox, either standalone or as part of the Marine Geospatial Ecology Tools. Specific functions can be accessed via forms or integrated within the scientific workflow of ModelBuilder. Examples will be demonstrated within coastal marine environments.

Coastal Mapping: Management Applications

Kensington B

E04. A LINEAR REFERENCING APPROACH TO COASTAL SHORELINE CLASSIFICATIONS AND OWNERSHIP STATISTICS FOR CONNECTICUT
Kevin O'Brien, Dave Kozak, Kevin Nebiolo, and Matte Thomas, Connecticut Department of Environmental Protection, Environmental & Geographic Information Center

Use and ownership of Connecticut's shoreline has historically been the focus of intense competition between industrial, commercial, recreational, and residential uses. Approximately 51 percent of Connecticut's statutorily defined coastal boundary is currently classified as "developed," and land fronting coastal waters is under increasing pressure for development. In order to effectively manage the shoreline for uses such as public recreation and ecological conservation, it is important to know how much of Connecticut's shoreline is currently owned and managed for these purposes. In the 1980s, Connecticut created a set of coastal shoreline statistics that classified shoreline types and summarized their length and ownership information. These data were derived from paper maps using manual cartographic methods and were used for over 20 years. As GIS data and tools became more robust and prevalent, the ability to update these statistics became apparent. In 2004, the Connecticut Department of Environmental Protection Office of Long Island Sound Programs developed a revised set of shoreline statistics based on a linear referencing system of routes with events tables. Using this approach to define shoreline types and integrate them with ownership and coastal resource data gives a clearer more accurate picture of Connecticut's coastal shoreline. In addition, this can readily accommodate different classification schema and can be positioned for integration with other route-based data such as the National Hydrography Dataset. These shoreline statistics provide important baseline data that are being used to evaluate the effectiveness of resource management programs and provide critical data for Federal coastal management performance indicators.

E05. MAPPING REGIONAL BOATING PATTERNS IN FLORIDA
Charles Sidman, University of Florida Sea Grant
Bill Sargent, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute
Robert Swett, Florida Sea Grant, University of Florida
Tim Fik, Department of Geography, University of Florida

Recreational boating is a key element in Florida's coastal lifestyle and a major contributor to its economy and population growth. Florida is the number one destination for marine recreation in the United States, including saltwater boating, with an estimated 22 million participants annually. Moreover, with over 1 million registered boats, Florida ranks first in the nation, with approximately one boat for every seventeen residents. As the quantity of boats that ply Florida's coastal waterways increases, so does the need for improved waterway access, waterway infrastructure maintenance, greater public safety, improved boater education, and enhanced resource management. Recognizing the need for socio-behavioral and spatial boating information, the Florida Fish and Wildlife Conservation Commission Florida Wildlife Conservation Commission's Fish and Wildlife Research Institute partnered with Florida Sea Grant to initiate a series of regional recreational boating characterizations aimed at compiling and integrating, within a GIS, detailed behavioral and spatial aspects of recreational boating. The methods and results of map-based mail surveys to characterize regional boating patterns and behaviors will be described, with particular emphasis on (1) seasonal spatial patterns, (2) spatial patterns of specific waterway access user groups (i.e., ramp, marina, dock users), and (3) regional distinctions in boating behaviors.

E06. A GEODATABASE OF BOATING ORDINANCES
David Fann, University of Florida Sea Grant

The Florida Fish and Wildlife Conservation Commission (FWC), Florida Sea Grant (FSG), and the University of Florida Levin College of Law's Center for Governmental Responsibility (CGR) are developing a statewide geodatabase of local (municipal and county) boating ordinances. With over 2,000 ordinances already included, this database has begun serving as a resource for waterway management planners and policymakers, law enforcement officials, and the boating public.

CGR identified relevant codes, obtained ordinance verbiage and attachments, and input the material into an MS Access database. FSG personnel, including University of Florida students, digitized the affected area (jurisdiction) for each ordinance in ArcGIS. Ground rules were to include laws that affected operation of vessels afloat in the water (not, for instance, on a trailer), to map only water area unambiguously identified from the code content, and to embed a unique identification number in each mapped jurisdiction's attributes for database operations. With appropriate relationships in place, users can access the information from the GIS or legal database perspective, based on spatial selections or attribute queries.

The project uncovered many spatial problems in present laws. The current widespread and expanding use of GIS in myriad organizations and disciplines make this an auspicious time to consider requiring application of spatial technologies in the creation, maintenance, observance, and enforcement of all laws, including those related to operation of vessels. Jurisdictions displayed on a GPS might obviate the need for many signs and waterway markers, and ready visualization of overlapping and sometimes conflicting laws could streamline permitting processes.

Tools for Ecosystem-Based Management III

Kensington C

E07. FLORIDA GEOSPATIAL ASSESSMENT OF MARINE ECOSYSTEMS (G.A.M.E.) PROJECT – DATA DISCOVERY
Cristina Carollo, Florida Institute of Oceanography
Dave Reed and John Ogden, Florida Institute of Oceanography
Henry Norris, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute
Frank Muller-Karger, University of South Florida/College of Marine Science

The key to ecosystem-based management of coastal and ocean environments is the identification of ecoregions which are the spatial framework for the application of new tools and programs in marine resources management. Marine ecoregions present special challenges since they are not easily compartmentalized and generally present a continuum of overlapping, often interdependent systems. Ecoregional assessment helps develop scenarios for management options and assists in the identification of (1) information gaps, (2) critical infrastructural relationships and (3) areas requiring protection for endangered species or critical habitats. The Florida Institute of Oceanography is coordinating a pilot project entitled Geospatial Assessment of Marine Ecosystems (GAME) to identify ecoregions in the coastal ocean of Florida and the adjacent waters of the Gulf of Mexico, Caribbean and South Atlantic Bight. The aim of the first phase of the project is to identify, catalog, and inventory physical, biological, chemical, geomorphological and human use information. A tool is available for data providers to submit relevant information online. This will be entered into the database and will be searchable by users on the GAME website. The project will assemble, for the first time, the many sources of marine related data in a Geographic Information Systems (GIS) format to identify ecoregions through a modeling effort. Collaboration is sought to create a statistically robust ecological model. The GIS synthesis effort will enable overlay of diverse information in a way that permits transparent and intuitive visualization and management planning of living marine resources in estuaries and marine waters.

E08. WHERE'S MY HABITAT? INCORPORATING FISHERIES TARGETS IN AN ECOREGIONAL PLANNING APPLICATION
Allison Bailey, Sound GIS
Zach Ferdana, The Nature Conservancy, Global Marine Initiative

The Nature Conservancy (TNC) has been involved in marine conservation planning in the Pacific Northwest for a number of years and has developed methods for analyzing the nearshore marine and coastal environment. The focus of the current work is to expand these ecoregional assessments offshore to consider deep-water, oceanic environments that are critical to groundfish and many other species. We synthesized existing, comprehensive data sets depicting groundfish distribution, including National Marine Fisheries Service's (NMFS) trawl surveys, for use in the Pacific Northwest Coast ecoregional planning process. We systematically examined multiple spatial aggregation schemes and resolutions. We also propose various quantitative measures or indices for describing groundfish species distribution, diversity, and abundance that can be included with other conservation targets in the analysis of priority areas. One of the primary challenges in offshore conservation planning is working in a data-poor environment. We must be cautious when extending the use of existing data sets beyond their original, intended purpose; however, we also must acknowledge the value of these data, (and the lack of other data), to assist in prioritizing areas important for groundfish. TNC intends to continue development of methods for incorporating groundfish data into the offshore ecoregional planning process, such that these approaches can be used in other ecoregions' planning efforts. Additionally, we will investigate habitat-species relationships and how this information can enhance the basic information on species distributions.

E09. PUMPING BLOOD INTO ECOSYSTEM-BASED MANAGEMENT THEORY: A PLANNING APPLICATION USING SPATIAL INFORMATION ON MARINE BIODIVERSITY AND FISHERIES
Zach Ferdana and Mike Beck, The Nature Conservancy
Dan Dorfman, Intelligent Marine Planning

Ecosystem-Based Management (E-BM) considers the cumulative impacts of different sectors and is intended to reverse the order of management priorities to start with the ecosystem rather than the species. Although genuine in its approach, transitioning this concept into information and ultimately decision-making is complicated and the path to its realization is unclear. Here we provide a practical example of how to take ecosystem-based spatial information, two decision support tools, and an overarching planning framework in order to put life into the E-BM theory.

This talk provides an overview of a planning framework that incorporates fisheries modeling and biodiversity conservation decision support tools. We will provide an introduction into how conservation planning and fisheries modeling can be incorporated into an integrated approach. Utilizing spatial information on ecosystems, habitats, and species in a portion of the Northern California Current, we will illustrate the framework of marine ecoregional planning along the outer coasts of Oregon and Washington. Within this framework we will demonstrate the use of MARXAN and Ecopath with Ecosim tools, providing one of the first examples where both tools are used to provide initial planning solutions to biodiversity conservation and fisheries objectives.

If we are to realize Ecosystem-Based Management in our planning efforts, one practical and powerful way is to take a multiple objective approach, making information and analyses transparent to decision makers and advancing integrated tool development.

Data Sharing II

Kensington F

E10. INTEGRATING NATIONAL, INTERNATIONAL AND MARINE GEOSPATIAL METADATA
Lynda Wayne, Federal Geographic Data Committee/GeoMaxim

The Federal Geographic Data Committee (FGDC) has long been responsible for maintenance of the Content Standard for Digital Geospatial Metadata (CSDGM). Though it is a federal standard, the CSDGM has been adopted by many state, local and tribal governments, much of the private sector and various thematic communities. With the adoption of the International Organisation for Standards (ISO) International Metadata Standard, the FGDC is now tasked with building a U.S. profile of the ISO metadata standard. The U.S. Profile effort is an opportunity to build a national (ANSI) metadata standard that conforms to ISO, supports transition from the CSDGM, enhances search and discovery and integrates the special needs of thematic communities such as the International Ocean Observation System (IOOS) and the Marine Metadata Interoperability (MMI) project.

E11. THE RAMONA GIS INVENTORY SYSTEM
William Burgess, National States Geographic Information Council

This session will describe the Ramona System which was produced by the National States Geographic Information Council as a tool for states and their partners. Its development was funded through a NOAA BAA grant. Its purpose is to inventory GIS in state and local governments to aid the planning and building of spatial data infrastructures. There are several benefits derived from using Ramona, including support for strategic planning efforts. The system helps to identify areas of need and to justify statewide GIS data and projects. Federal agencies may begin to use the Ramona GIS Inventory for future funding allocations to states as they identify GIS needs and priorities. Since September 11th, emergency managers have emphasized that it is critical to 1) have an inventory of all organizations' data, and 2) have a directory of people – the Ramona GIS Inventory does both! The 2006 Homeland Security State Grant Guidance for GIS recommends that users participate in the Ramona GIS Inventory. Ramona will reduce the number of federal agencies needing to independently inventory your data for program specific purposes (less time spent answering the same questions over and over again!). If you don't already have metadata, Ramona can help you jump-start your metadata efforts by automatically producing starter-metadata for you. Ramona is a "living inventory" that will let you update your responses at your convenience to make sure that your information is up-to-date. It's designed to work with the Geospatial One Stop (*www.geodata.gov*) and will pass your updated information to GOS.

E12. GLINDA: A DISTRIBUTION MODEL FOR GREAT LAKES GEOSPATIAL DATA
Pete Giencke, Great Lakes Observing System
Roger Gauthier, Great Lakes Commission

The Great Lakes Information Network Data Access Clearinghouse (GLINDA) is an application designed to facilitate the dissemination of Great Lakes-related datasets. Such datasets include real-time monitoring data collected as part of the Great Lakes Observing System (GLOS), along with ISO 19115 themed regional geospatial data. Through GLINDA, these data are to be made available to the general public as both web services and through a wide variety of other formats (GML, KML, et al). These data are to be hosted on the Great Lakes Information Network (GLIN). Additionally, data ingested into GLINDA can be published to Geospatial Onestop (GOS), thereby providing yet another way of accessing these data.

Plenary Lunch

12:00 to 2:30 p.m.

Kensington Ballroom

The Geography of Disaster Losses
Dr. Susan Cutter, University of South Carolina

Dr. Susan Cutter is a Carolina Distinguished Professor of Geography at the University of South Carolina and is the director of the university's Hazards and Vulnerability Research Institute. Dr. Cutter received her B.A. from California State University, Hayward, and her M.A. and Ph.D. (1976) from the University of Chicago. Her primary research interests are in the area of vulnerability science—the study of what makes people and the places where they live vulnerable to extreme events and how this vulnerability is measured, monitored, and assessed.

Afternoon Sessions

2:30 to 4:00 p.m.

Remote Sensing: Land Cover

Kensington A

F01. BOUNDARY LAND COVER MAPPING: MERGING MEDIUM AND HIGH RESOLUTION IMAGERY TO PRODUCE LARGE AREA LAND COVER MAPS
Michael Palmer and Andrew Brenner, Sanborn

Many state and local agencies are looking for the next step in land cover mapping to fulfill the needs of their constituents. Many of the existing national mapping programs do not adequately quantify land cover to a desired spatial resolution or the classification scheme. Leveraging from existing medium resolution land cover mapping products, Sanborn has developed a methodology that extracts the boundaries of distinct land cover features using high resolution imagery and labels these boundaries based on a medium resolution land cover data set. This new procedure retains both the spectral quality of the medium resolution multi-temporal sensors and the spatial quality of the high resolution sensor. The tool allows for the creation of high resolution land cover maps based on a refined classification scheme relevant to state and local users. Sanborn has prototyped this methodology in Maine and the U.S. Gulf Coast, and has refined the methods in Kentucky and Hawaii.

F02. DEVELOPING COLLABORATIVE LANDCOVER DATA IN MAINE
Michael Smith, Maine Department of Environmental Protection
Michael Palmer and Andrew Brenner, Sanborn
Nate Herold, NOAA Coastal Services Center

Maine recently completed a landmark landcover and imperviousness mapping project in cooperation with NOAA, USGS, and Sanborn Solutions. The project integrates fully and extends upon the NOAA and USGS CCAP/NLCD 2001 framework by increasing the spatial resolution to 5 meters, modifying the landcover classification slightly to meet needs of Maine users, and adding a 5-meter imperviousness layer. This presentation will discuss the levels of cooperation required to complete this project, the technical methods of developing the data, and the results now that the project is complete.

F03. A GIS EXPERT SYSTEM FOR RIPARIAN BUFFER DELINEATION AND LAND COVER MAPPING WITH HIGH-RESOLUTION IMAGERY

Dmitry Varlyguin, Stephanie Hulina, and Luke Roth, Geospatial Data Analysis Corporation
Peter Claggett, Chesapeake Bay Program Office, U.S. Geological Survey
Sally Claggett, U.S. Department of Agriculture, Forest Service

High-resolution imagery (HRI) is required to accurately map and track riparian buffers (RB). Existing approaches to mapping RB rely on disparate sources of spatial information, including water datasets digitized from DOQQs and topomaps and land cover (LC) information obtained through the analysis of less detailed, medium resolution imagery. The resulting spatial datasets typically have different resolutions and levels of accuracy, and represent different acquisition/ generation dates. This leads to spatial misrepresentation of water features, RB, and LC estimates in the final analytical results. GDA Corp. with support from the USGS and USDA Forest Service has developed a working prototype of a highly automated GIS expert system for RB delineation and LC mapping using HRI. The system overcomes limitations of current state-of-the-art schemes by directly analyzing HRI. The system fulfills the need for specialized GIS tools to improve the accuracy of RB delineation and inventory and to simplify the analysis of HRI. The system exploits spectral, spatial, and contextual information present in the imagery to identify four LC types (water, herbaceous vegetation, woody vegetation, and bare ground). It also utilizes ancillary hydrological vector datasets to help identify narrow stream corridors. Two options for RB delineation are provided: two-dimensional Euclidean distance assuming a flat surface and three-dimensional Euclidean distance accounting for topographic relief. To ensure performance accuracy, the system allows for in-process inspection and editing of the results by the image analyst and the integration of expert knowledge for further data analysis.

Coastal Mapping III

Kensington B

F04. SPATIAL ANALYSIS OF BEACH RIDGES AND CAPE GEOMORPHOMETRY FOR RECONSTRUCTION OF PALEOSHORELINES AND SEA-LEVEL RISE, CAPE HENRY, VIRGINIA

Tom Allen, East Carolina University
George F. Oertel, Old Dominion University, Ocean, Earth and Atmospheric Sciences

Protocols were developed for analyzing spatial responses of the Cape Henry spit complex to late Holocene sea-level rise. Digital elevation models and geomorphic analyses were used to develop chronosequences for beach and dune ridges of the spit, inundated coastal bays, modern and paleoshorefaces, and shore morphometry. A technique for sea-level reconstruction was derived by spatial analysis of sequential dune ridge and swale topography, providing a means to link dune morphology (swale depth) and sediment supply, and to predict past shoreline position and shoreface sediment storage. Photogrammetric spot heights and airborne topographic LIDAR data were integrated with digital raster graphics and large-scale vector shoreline data. Isobaths from the topographic quadrangle were digitized to determine slope and toe depth of the modern shoreface. These data provided a 3D model of the antecedent surface base of the prograding spit complex shoreline. Triangulated irregular networks were created for the subaerial cape and subaqueous shoreface for volumetric analysis of the cape and individual beach ridges and sets. Results highlight relative and potential absolute ages of formation and inundation, corroborated with paleogeologic and archeologic data. Measured volumes and paleoshorelines suggest the Virginia Beach coastal compartment is related to embryonic spit development from a late Holocene shoreline located 4 km eastward of the current beach. Further technological advances, such as fusion of LIDAR and high spatial resolution imagery, hold promise for improving prediction of shoreline change, spit morphodynamics, and biogeomorphic interactions with rising sea-level.

F05. VISUALIZING THE TEXAS COAST

Tiffany Hepner, James C. Gibeaut, and John R. Andrews, Bureau of Economic Geology, University of Texas at Austin

As coastal scientists it is extremely important to find a medium to convey our research and knowledge of coastal environments to students and the general public. The Bureau of Economic Geology has created a computer model that allows users to visualize and explore a barrier island system in an interactive, 3-D, immersive environment. High resolution digital elevation models (DEMs), derived from airborne laser terrain mapping technologies, and other more conventional GIS datasets from Galveston Island and other Texas coastal settings are the foundation for the models found within the 3-D project. Users are able to “fly” around the virtual barrier island examining the physiographic settings of various environments and gain an appreciation of how those have changed through time. Another aspect of the model allows investigators to visualize and explore how Holocene sea level change has formed the coastal bays and barrier island systems that are typical along passive tectonic margins such as the Texas Gulf of Mexico coast. A more detailed model shows how relative sea level rise has changed Galveston Island over the last 150 years and predicts the changes we are likely to see during the next 100 years as the sea continues to rise. This virtual reality project can be downloaded to any student or individual’s computer and run as a self-guided tour, or it can be used as a presentation tool for coastal scientists and teachers in a more structured setting. The virtual reality model is an innovative approach to educating students and the public in coastal issues and expanding the reach of coastal data and research.

F06. OPEN SOURCE GIS SOFTWARE AND ITS POTENTIAL USE IN THE POST GRAD ENVIRONMENT

Gary Watry, Center for Ocean-Atmospheric Prediction Studies, Florida State University
Daniel Ames, Idaho State University
Jesse Eichar, Refractions Inc.
Gary Sherman, Quantum GIS

One of the major issues that arise with the introduction of Geospatial technology in a post-college education or research program is the inherent cost of Commercial off-the-shelf software (COTS). The initial cost and annual maintenance fees for most COTS, is hard to justify by the occasional use of these applications in Non-GIS courses and research projects. The introduction of Free Open Source Software (FOSS) at the college and post-grad level will make available the powerful tools of Geospatial analysis without the cost. As FOSS applications achieve parity and in many cases exceed the capabilities of the comparative COTS tools, a valuable tool is available to the grad student or research assistant. Once educated in the usefulness and availability of FOSS applications, the individual would be able to download, utilize, and then discard the appropriate GIS tools until the next time they were useful. Several other benefits are also obvious in that the research assistant or student has the ability to verify what is going on internally and the flexibility to tweak any aspect of the system in experimentation to achieve the correct results. A benefit to the education/research community itself is the ability to disseminate solutions to other researchers without requiring them to acquire software licenses first. The community is able to build their own tools or build on top of existing tools. Then in subsequent years, different researchers and students continue adding on to it. The end result of this collaborative effort is a more comprehensive package than would be available if the researcher had purchased a canned product (COTS) or started from scratch on their own. If and when the FOSS applications are not capable of meeting the needs of the user, then and only then should the individual be encouraged to examine COTS.

Land Use Planning III

Kensington C

F07. BUILDING COASTAL COMMUNITY CAPACITY TO PLAN FOR AND PROMOTE SUSTAINABLE SHORELINE MANAGEMENT APPROACHES
Audra Luscher, Maryland Coastal Program
Marcia Berman, Virginia Institute of Marine Science

Maryland has put forth considerable effort and resources to improve geospatial information along the shoreline, including LIDAR, updated shoreline change data (DSAS), and the development of the Comprehensive Shoreline Inventory (CSI). In particular, the CSI is providing State and local planners the information to comprehensively assess shoreline conditions on a regional and local scale, significantly improving the capacity to identify and target the appropriate means of shore erosion response. Although acquiring new data provides the science to make planning and policy decisions, often the data needs to be developed into a spatial decision support tools for local land use managers; in an accessible format like internet mapping systems; and utilized in an array of educational campaigns. Two coastal managers will discuss how they are cooperatively building coastal community capacity to plan for and promote sustainable shoreline management approaches.

F08. WORKING WATERFRONT ACCESS: MAPPING THE MAINE COAST'S ECONOMIC FUTURE
Robert Snyder and Shey Conover, Island Institute

Working waterfronts account for $740M of Maine's economy and employ approximately 23,000 people. Beginning in the summer of 2005, the Island Institute and its partners embarked on a community-based mapping project to quantify the working-waterfront resources for Maine's 149 coastal towns. The goal of this research effort is to create a new tool in the form of a statewide Working Waterfront Access Map to facilitate dialogue between two historically divided coastal constituencies: the conservation community and the commercial-fishing community. This paper will discuss the challenges and successes of this effort, the community participation process, the overall impact this research is currently having in Maine and its possible applications in other areas of the country. Issues such as defining working-waterfront access, setting protocol for public-data access, and the sustainability of mapping research are topics that this project will have addressed by the end of 2006. A model methodology will be outlined that explores the potential for this community-based mapping effort to be replicated in other working waterfront states.

F09. SHORELINE CHANGE ANALYSIS AND PLANNING USING ARCGIS MODEL BUILDER
Kollin Higgins, Beth Cullen, and Ken Rauscher, King County Department of Natural Resources and Parks

The Shoreline Management Act of 1972 required local jurisdictions in Washington State to create Shoreline Management Programs (SMP). Under the new guidelines passed by the State in 2003, King County needs to update its 30-year old SMP by 2009. A critical step to updating an SMP is to perform an ecological characterization analysis of shorelines of the state. King County has 52 miles of marine shoreline, 294 miles of lacustrine shoreline and over a thousand miles of riverine shoreline. King County constructed a series of raster based additive models in ArcGIS's Model Builder to characterize how the physical and chemical processes of these shorelines have been altered by development. While this type of analysis is not new, Model Builder allows for a more user friendly interface than performing similar analyses via scripting. In addition, once the models are created they are easier to modify and rerun to test different scoring scenarios. The ecological characterization results will be used as part of a decision matrix to create "environmental designations" along the shorelines. Designations determine how each reach of the shoreline will be managed. The characterization will also be used to develop restoration and public access plans. After the regulations have been drafted, a cumulative impacts analysis will be completed to evaluate the new draft Shoreline Master Program. This will be done by modifying the input data of the initial ecological characterization model to show maximum build-out conditions and then compared to the initial conditions to quantify the likely cumulative impacts.

Data Sharing: IOOS

Kensington F

F10. TOWARD AN OCEAN-OBSERVATION SYSTEM OF SYSTEMS
Eric Bridger, Gulf of Maine Ocean Observing System
Philip Bogden, Southeastern Universities Research Association
Luis Bermudez, Monerey Bay Aquarium Research Institute
David Forrest, Virginia Institute of Marine Science

The earth- and ocean-science communities are developing the concept of a 'system of systems' (*www.epa.gov/geoss*) for observing the earth and oceans. Related initiatives in the ocean sciences range from the application-oriented Integrated Ocean Observing System (IOOS) to the research-oriented Ocean Observatories Initiative (OOI). In an ideal world, all ocean observations would support the broad range of activities because all the systems would be interoperable. Such a 'system of systems' will surely result from standardization of some kind. One challenge is that we already have many standards that address data-encoding formats, content metadata, protocols for communicating between computers, and ontology languages for knowledge representation. Two grass-roots community initiatives have aligned to make some concrete choices that will advance the 'system of systems' concept: the Marine Metadata Interoperability (MMI) interoperability demo (*www.marinemetadata.org*) and the OpenIOOS interoperability test bed (*www.openioos.org*). Although they have substantial overlap, each initiative brings a complementary set of experiences to the table. With funding from NSF and NOAA, the MMI project has been enabling the exchange, integration and use of marine data by emphasizing ontologies that employ the Web Ontology Language (OWL), in anticipation of the Semantic Web. With funding from the Office of Naval Research and NOAA, OpenIOOS participants have been demonstrating that 'standards enable innovation' by leveraging web-service and data-model specifications developed by the Open Geospatial Consortium (*www.opengeospatial.org*). We present the lessons learned from this coordinated and combined effort.

F11. THE GULF OF MAINE OCEAN DATA PARTNERSHIP – BUILDING A REGION-WIDE INFORMATION SYSTEM TO SUPPORT GULF OF MAINE RESOURCE MANAGEMENT
Tom Shyka, Gulf of Maine Ocean Observing System
David Mountain, Northeast Fisheries Science Center/NOAA
Evan Richert, University of Southern Maine
Philip Bogden, Gulf of Maine Ocean Observing System

How do you find, access and integrate geospatial data related to the Gulf of Maine to use for resource management decision making? The Gulf of Maine Ocean Data Partnership (GoMODP) hopes to simplify the answer to that question in the near future. The GoMODP is comprised of 22 organizations that collect and manage environmental data within the Gulf of Maine and its watershed. Members include federal, state, provincial, university and research organizations in the U.S. and Canada. Most of the data collected by the partners has a geospatial component to it and could eventually be used within a geospatial framework to support resource management activities. The goal of the partnership is to make each partner's long term datasets discoverable,

accessible, and eventually interoperable through tools available on the internet. The partnership intends to use standards and protocols already in use by the various disciplines represented wherever possible. To meet the Partnership goal we have initiated pilot projects designed to meet specific end user requirements in the areas of fisheries and coastal water quality management. Partners are gaining practical experience regarding the use of interoperable data access techniques like web services. The Partnership seeks to advance a truly integrated ocean observing system in the Gulf of Maine. Designed and implemented as a grass-roots organization, it will be an important building block of the nascent Northeast Regional Association that will become a component of the U.S. Coastal Integrated Ocean Observing System (IOOS) and a member of the National Federation of Regional Associations.

F12. COASTAL SENSOR WEB ENABLEMENT: SYNTACTIC STANDARDIZATION AND SEMANTIC ENRICHMENT

Surya Durbha, Yangron Ling, Roger L King, and Nicolas H. Younan, GeoResources Institute, Mississippi State University

The Sensor Web Enablement (SWE) framework being proposed by the Open Geospatial Consortium (OGC) puts forward a number of new open standards for enhanced distribution and sharing of sensor data from the multitude of distributed sensor networks in variety of domains. It allows a collaborative, coherent, consistent, and consolidated sensor data collection, fusion, and distribution system. This paper is focused towards the Sensor Web Enablement of coastal buoys. Coastal buoys and stations provide frequent, high-quality marine observations for oceanographic study, weather service, atmospheric and public safety. Sharing of the generated data sets requires tremendous efforts and coordination among the different sensor network agencies (e.g. NDBC, GoMOSS etc.) to come to a shared understanding and for dissemination in a uniform way. Syntactic standardization provides data description models that are agreed upon by all the stakeholders. The syntactic Coastal Sensor Web Component (CSWE) component of this research would provide the following potential benefits:

- Describe the coastal sensors and observation processes with general models and XML encodings through Sensor Markup Language (SensorML) that will fully describe them and, hence, facilitates the dynamic retrieval of their capabilities and quality of measurements.
- Use of real or near real time data derived from coastal sensor networks (e.g. NDBC, GOMOOS, etc) and satellite remote sensing data sets.
- Dynamic selection and aggregation of multiple sensor systems, meteorological and oceanographic simulations and other decision support systems in a web services based environment that provides capabilities for discovering systems, observations, and observation processes that meet an application or users immediate needs.

In addition, there is a need for semantic enrichment of the information sources which would help to understand the context of the data and helps to resolve the meaning, interpretation or usage of the same or related data. Hence, we approach the problem domain by modeling the semantics of the data as a layer on top of the proposed syntactic standardization instead of just relying on the syntactic and structural representations. We pursue the semantic web approaches to develop knowledge bases for the data sources. Knowledge bases are collections of Ontology Web Language (OWL) statements about resources.

Reception in Palmettos Pavilion

7:00 to 10:00 p.m.

Come Hawaiian style to the Palmettos Pavilion for the Wednesday night luau. Get a taste of the tropics with island cuisine and a special musical group. Be prepared for high energy fun and an experience that you will never forget. The reception will include heavy hors d'oeuvres and a cash bar.

No transportation is needed . . . just walk out the back of the Kingston Plantation. Feel free to bring your spouse or friend, but please note that additional guests will incur an added cost of $60 a person. Attire is casual.

Thursday, March 8

Early Morning Sessions

9:00 to 10:30 a.m.

Habitat Mapping III

Kensington E

G01. THE MAPCOAST PARTNERSHIP: MAPPING SUBAQUEOUS SOILS IN SHALLOW ESTUARINE AND LAGOONAL ECOSYSTEMS
Mark Stolt and Mike Bradley, University of Rhode Island
Jim Turenne, U.S. Department of Agriculture, Natural Resources Conservation Service
Margot Payne, University of Rhode Island

Coastal managers, resource specialists, and wetland scientists have considerable interest in subaqueous soils to support decision making in shallow subtidal habitats. Important applications of subaqueous soil data in the northeastern United States include identifying areas for restoration of aquatic vegetation such as eelgrass, locating areas suitable for aquaculture, deciding whether an area should be dredged, the fate of the dredged materials, and the fate and transport of pollutants entering an estuary. As one of the founding agencies of the The MapCoast Partnership, the Natural Resources Conservation Service (NRCS) has been tasked with mapping and describing subaqueous soils. As a result, numerous subaqueous soils projects have been initiated by the NRCS (and others) in Connecticut, New York, Maine, Delaware, Maryland, Florida, Massachusetts, Rhode Island, and Texas. One of the major obstacles to many of these projects is that only minimal information on methodologies that are appropriate for conducting a subaqueous soil survey is available. Therefore, one the major goals of the MapCoast Partnership is to develop methods, techniques, and a standard protocol and classification system for mapping subaqueous soils. In this paper, methods for sampling, delineating, and analyzing subaqueous soils are discussed and illustrated.

G02. UNDERWATER VIDEO MAPPING FOR ASSESSING AND MONITORING CORAL REEF ECOSYSTEM HEALTH
Paul Ayers and Rebecca Messer, University of Tennessee
Richard Curry, Biscayne National Park, National Park Service

Assessing and monitoring coral reef ecosystem health is essential for understanding the environmental impacts. An Underwater Video Mapping System (UVMS) is a technique to acquire Global Positioning System (GPS)-based georeferenced underwater images that allow mapping of underwater features. Using the UVMS, underwater features essential for assessing and monitoring coral reef ecosystem health can be acquired and mapped using Geographic Information System (GIS). The UVMS was used to acquire underwater images in sections of the coral reef ecosystem in Biscayne National Park (BISC). Factors contributing to the assessment of coral reef health were identified and mapped. These features include marine debris (discarded items including ropes, traps, etc.), coral damage (from boat, anchor, etc.), coral disease and other health issues (i.e. black band disease), endangered coral species, and indicator fish (fish that suggest good water quality). The UVMS is a useful tool for providing large-scale assessments of the coral ecosystem health, and identifying areas that need further detailed investigation. It also provides an opportunity to resurvey the same coral reef ecosystem and monitor health changes.

G03. AN ECOLOGICAL CHARACTERIZATION OF THE GULF OF MAINE REGION
Bryan Costa, Tim Battista, Randy Clark, and Simon Pittman, NOAA National Centers for Coastal and Ocean Science

The National Oceanic & Atmospheric Administration's (NOAA) Center for Coastal Monitoring and Assessment's (CCMA) Biogeography Team collaborated with the National Marine Sanctuaries Program (NMSP) to perform a biogeographic assessment of the marine region surrounding Stellwagen Bank National Marine Sanctuary. This work integrated physical and biological GIS and remotely sensed datasets in an effort to temporally and spatially characterize fish, seabird, macroinvertebrate and marine mammal distributions in the Gulf of Maine. The resulting statistical relationships among these variables were used to predict cetacean and seabird species distributions where there were gaps in the survey effort. Predictive models, such as these, offer promising opportunities to extrapolate information to broad spatial scales, allowing resource managers make informed decisions in support of ecosystem-based management.

Coastal Mapping: Shoreline Change I

Kensington F

G04. POST-HURRICANE EVALUATION OF THE PERFORMANCE OF COASTAL ARMORING STRUCTURES UTILIZING SPATIAL ANALYST
Kathryn Ketteridge and Jeffrey R. Tabar, PBS&J
Gene Chalecki, Florida Department of Environmental Protection

The authors completed a performance evaluation of selected coastal protection structures and their effects on localized sediment transport in Florida Counties affected by the 2004 hurricane season for the Florida Department of Environmental Protection (FDEP). This evaluation was limited to coastal armoring structures only, including revetments, bulkheads, seawalls, and sand-filled containers used in those capacities. One hundred and eleven total structures were identified and analyzed for level of damage. From these structures, eight were chosen for an in-depth evaluation, which included analyses of post-storm LIDAR data to determine structural damages to the identified coastal armoring structures and any effects these structures may have had on the surrounding beaches during storm events.

The spatial analyst module of ArcView (version 9.1) was utilized to perform this evaluation. The following outlines the procedure that was followed:

- Raster maps of pre- and post- hurricane conditions in the vicinity of the eight structures were created.
- Changes to the elevation of the beach were then calculated with the raster calculator.
- Damages to the structures were determined from these results including:
    - Loss of structural material
    - Volume of backfill lost from behind structure
    - Depth of undermining
    - Spatial extent of flanking
- Potential effects on the surrounding beaches in the vicinity of the structure were analyzed, including:
    - Compression of beach contours
    - Lowering of the beach
    - Slope of the beach profile
    - Comparison of the above parameters with those of an unarmored shoreline in the vicinity of the armoring structure.

G05. LIDAR ANALYSIS OF STORM-INDUCED GEOMORPHIC CHANGE OF A TEXAS BARRIER HEADLAND

Ray Newby, Daniel Gao, and Scot Friedman, Texas General Land Office

Lidar data was used to monitor coastal barrier headland (CBH) habitats on the Gulf of Mexico coast of Jefferson County, Texas to determine the extent of geomorphologic changes to these areas resulting from coastal erosion. The CBH areas comprised of beaches, dunes, and chenier ridges protect fresh and brackish wetlands from the wave action and inundation from the Gulf of Mexico.

Supporting the U.S. Army Corps of Engineers Sabine Pass to San Luis Pass Shoreline Erosion Feasibility Study, the Texas General Land Office used lidar-derived digital elevation models (DEMs) to create bare earth DEMs of the upper Texas coast. Supratidal and dune habitats within the CBH areas were determined by classification of the DEMs. Supratidal habitats were defined as CBH areas with elevations ranging from 2 to 5 feet above mean sea level (msl) with dune habitats defined as CBH areas with elevations exceeding 5 feet msl.

GIS analysis of DEMs generated from 2001 and 2005 (post-Hurricane Rita) lidar datasets was used to determine the amount of change of the various habitat types resulting from the impact of Hurricane Rita in September 2005. The GIS analysis confirmed the degree of erosion occurring to the CBH habitats, but also yielded information on the landward transport of littoral sediment by means of overwash from the Gulf of Mexico. Data obtained from this analysis are being used for the design of erosion response and environmental restoration projects to restore dunes and beach ridge elevations to protect marshes of the McFaddin NWR.

G06. SHORELINE SEDIMENT EROSION IN THE CHESAPEAKE BAY

Katherine Hopkins, University of Maryland, Center for Environmental Science
Effrey Halka, Maryland Geological Survey
Scott Hardaway, Virginia Institute of Marine Science
Lamere E. Hennessee, Maryland Geological Survey

Erosion of unconsolidated shorelines concomitant with sea level rise has been recognized as one of the major sediment sources for Coastal Plain estuaries. Other sources are sediment derived from the watershed, internal production, and oceanic inputs. Quantifying those sources is important both for understanding the long-term evolution of estuaries as they respond to a transgressing sea and to provide a basis for informed management decisions designed to improve water quality and preserve a productive natural resource. Recently the federal/state Chesapeake Bay Program partnership has committed to reducing sediment loads to the Chesapeake Bay to achieve water clarity standards and restore critical benthic habitats. To address these issues and to gain an understanding of the degree to which shorelines contribute to the overall sediment budget, we've updated the estimates of shoreline erosion for the entire Chesapeake Bay. Consistent temporal and spatial data for erosion rates, bank heights, shoreline protection, and sediment type were unavailable for the entire Chesapeake Bay and varied greatly between Maryland and Virginia.

For the Maryland portion of the Chesapeake, the updated estimate includes new data from shoreline locations spanning approximately the last 50 years, along with a recent assessment of the degree of shoreline armoring with bulkheads and revetment. In Virginia, only limited portions of the estuarine shoreline have similar information. Available reports from the early 1990's were expanded in the Virginia portion of the estuary and incorporated some comparable information derived from the more comprehensive Maryland data sets. We calculated upland erosion along armored shorelines, associated with the recession of the shore (fastland erosion), and estimated the associated "nearshore erosion" due to progressive downcutting of the sub-aqueous portion of the former shoreline areas, for both armored and unarmored shorelines.

Land Use Planning: Conservation

Windsor Ballroom

G07. CONNECTICUT'S COASTAL LAND ASSESSMENT METHODOLOGY (CLAM)

David Kozak and Kevin O'Brien, Connecticut Deptartment of Environmental Protection, Office of Long Island Sound Programs
Margaret Thomas, Connecticut Deptartment of Environmental Protection, Environmental & Geographic Information Center
Kevin Nebiolo, Connecticut Deptartment of Environmental Protection, Office of Long Island Sound Programs

The Connecticut Department of Environmental Protection's Office of Long Island Sound Programs' Coastal Land Assessment Methodology (CLAM) project is a multi-phased GIS based planning effort to identify and rank unprotected coastal parcels with significant ecological or coastal resource based recreational value. These parcels will constitute an inventory of potential sites suitable for future acquisition or other conservation efforts. The project's first phase created an inventory of significant (> 25 acres) unprotected and undeveloped tax parcels ranked according to their potential conservation value. This involved spatial analyses of data ranging from municipal tax parcel boundaries and assessor's databases to state-wide environmental GIS layers (e.g., hydrography, land cover classifications, aerial photography, etc.) to derive a parcel's preliminary conservation score. These scores were based on the parcel containing or being adjacent to distinctive coastal features (such as tidal wetlands, water frontage, sandy beaches, and existing protected open space) as well as the parcel's size, percentage developed, and lack of significant structures or facilities. The second phase further evaluated and refined these parcel's scores by determining if they also included sites listed in the Connecticut Natural Diversity Database, contained significant inland wetlands, or possessed other unique ecological values pursuant to the expert opinion of Department staff and other external experts (such as academics, local land trusts/conservation organizations, citizens, etc.) The data collected through CLAM project (approximately 200 potential sites) is being used to develop a more proactive and comprehensive approach to conserving the most significant remaining unprotected areas along Connecticut's coast.

G08. OPEN SPACE ANALYSIS, SOUTH SHORE ESTUARY RESERVE, LONG ISLAND, NEW YORK

Jeffrey Herter and Peter Lauridsen, New York State, Department of State

The NYS Department of State Division of Coastal Resources (Division) conducted an analysis of open space in the South Shore Estuary Reserve (SSER) of Long Island. Division modified NOAA Coastal Services Center's 1994 C-CAP land cover data and overlaid it with cadastral data. All parcels identified as developed, impervious or water were stripped out and parcels that were publicly owned or protected by not-for-profit organizations were also removed, resulting in a layer of privately owned open space areas. Parcels greater than 5 acres in size were selected. This initial analysis resulted in identification of nearly 900 parcels throughout the SSER. Division developed a priority system to identify areas most in need of protection. A list of criteria to weigh each open space area was created. Scores were developed for each criteria such as proximity to natural heritage areas, tidal wetlands, etc. Scores were added for each area resulting in a prioritized list of open space in the SSER. Study results have been used in selecting open space for the State's Open Space Plan and by Towns in the SSER for identifying areas in need of protection.

G09. LINKING MARINE AND TERRESTRIAL CONSERVATION PLANNING
Patrick Crist and Pat Comer, NatureServe
Fernando Silva, Conservation Trust of Puerto Rico
Sarah Carr and Jon Hak, NatureServe

To date, most conservation planning activities have been separated across major ecosystem divisions leading to lost opportunities to leverage conservation of linked ecosystem processes. NatureServe and partners are addressing this problem through conservation applications that link terrestrial, freshwater, and marine conservation prioritization. We will present a case study from Puerto Rico where we are working collaboratively with the Conservation Trust of Puerto Rico and a broad partnership of local and regional entities to develop and implement conservation priorities. A variety of spatially-enabled decision support and modeling tools are being used to support this work and NatureServe is leading the development of a network and center of knowledge for coastal-marine ecosystem based management tools. We will highlight the work of the EBM Tools Network to develop a framework for EBM tool application and interoperability guidelines to support analysis across ecosystem divisions.

Data Sharing III

Somerset

G10. DEVELOPMENT OF A SPATIALLY-ENABLED DATABASE IN SUPPORT OF SOUTHEASTERN TIDAL CREEK RESEARCH AT THE NOAA HOLLINGS MARINE LABORATORY
David White and Danna Wolf, NOAA Hollings Marine Laboratory
Dwayne E. Porter, Arnold School of Public Health and Baruch Institute, University of South Carolina

The NOAA Center of Excellence for Oceans and Human Health Initiative (OHHI) at the Hollings Marine Laboratory (HML) is developing a common framework that allows data from different projects and scientific disciplines to be shared and reused across computer applications and user-interfaces. Counter to traditional data management where databases and models were developed for a single scientific domain (e.g., estuarine ecology or marine genomics), an objective within the OHHI, is a global perspective to data and information systems that will aggregate information across scientific domains. The intent is to ensure that all facts and relationships known about a subject of investigation are related within a data and information management system. This facilitates the development of novel integrated models, ideas, and new questions by OHHI researchers and the resource management community. For example, investigators and database managers are beginning to integrate demographic and socio-economic data into an environmental stress and response database for southeastern tidal creeks. The OHHI information architecture will be flexible to support integration across a wide spectrum of institutions and include data of multiple environmental and spatial scales, leveraging open standards such as those developed by the Open Geospatial Consortium (OGC). Our internal databases include an environmental matrix of water quality, chemical contaminant, species abundances and human dimensions data from southeastern tidal creeks and watersheds. Current efforts are directed towards the development of spatially enabled data management systems that allow users to discover, browse and export data and browse external data sources in a common framework.

G11. THE HYDROLOGIC DASHBOARD: ACCESSING AND VISUALIZING WEB SERVICES TO SUPPORT WATER RESOURCE MANAGEMENT
David Hart, University of Wisconsin, Aquatic Sciences Center
Puneet Kishor, Sam Batzli, Evan Murdock, AJ Wortly, and Nate Kraus, University of Wisconsin
AJ Wortly, Wisconsin State Cartographer's Office
Ben Houston, Institute for the Application of Geospatial Technology

This presentation illustrates the idea of a "hydrologic dashboard", a web browser interface to integrate and visualize distributed web services to support water resource management. The dashboard consumes web services in XML format from USGS stream gages, NOAA weather observations and coastal buoys, as well as NASA and NOAA satellite imagery. It includes modules to visualize the temporal characteristics of stream flow and precipitation data in conjunction with MODIS and NEXRAD radar imagery. In some cases, web services are directed into intermediate PostGIS/PostGRES databases to store historical events and serve the data to the dashboard client. This allows water resource managers and researchers to explore, define, and analyze recent and historic storm events and view the spatial and temporal patterns that result. The project leverages several open technology protocols ranging from AJAX and DHTML, to some of the web mapping specifications of the Open Geospatial Consortium. The hydrologic dashboard project is a partnership between the University of Wisconsin-Madison and the Institute for the Application of Geospatial Technology (IAGT) in Auburn, New York. IAGT administers a NASA-funded project titled: "Cooperative Decision Support Technologies for the Northeastern United States: Bridging NASA and USGS Technologies." The project makes effective use of a range of web collaboration technologies to promote a social network to address an interdisciplinary environmental issue.

G12. GEOSPATIAL INTEROPERABILITY FRAMEWORK
Christopher Lakey, Image Matters LLC

In this paper we discuss the need for discovery and access to distributed geospatial services and data. We present a standards based geospatial interoperability framework and describe the core standards: OGC Web Mapping Service (WMS), OGC Web Feature Service (WFS), OGC Catalog Service (CSW), Web Map Context and GeoRSS. To illustrate the power of a geospatial interoperability framework we will introduce the Context Sensitive Situation Awareness (CSSA) application we developed for the Department of Homeland Security. CSSA provides a unique Common Operating Picture (COP) capability supporting "Context-Sensitive Situational Awareness". CSSA features a COP Interoperability Framework for geospatial data and services, a standards-based framework for integrating distributed COP resources. It features a variety of geospatial data sources, including GeoRSS feeds. Finally, we provide implementation guidance using both open source and commercial software packages. We describe the strengths and weaknesses of current technology and discuss opportunities for improvement.

Break

10:30 to 11:00 a.m.

Late Morning Sessions

11:00 a.m. to 12:30 p.m.

Habitat Mapping: Benthic Environments

Kensington E

H01. BENTHIC COMPLEXITY MODELING WITH COARSE GRAIN (90M) BATHYMETRIC DATA: IS IT POSSIBLE?
Daniel Dunn and Patrick Halpin, Duke University

Benthic complexity, which may be thought of as the roughness of the seafloor, is an indicator of hardbottom substrate. Hardbottom is habitat for a wide variety of commercially important fish species and acts as an island of biodiversity in the surrounding mud/sand bottom. Several benthic complexity models have been put forth recently as surrogates for fish habitat in marine reserve design or to help classify marine environments. However, lack of high-resolution bathymetry, indices based on arbitrary equations and reclassification schemes, and limited improvement over depth-difference analysis have left these models open to criticism. Most benthic complexity studies have not been performed at a landscape scale, and it is unclear whether current bathymetric datasets with regional coverage can be used in these models. This raises an essential question: Do we have sufficient and appropriate bathymetric data to operate essential fish habitat (EFH) and ecosystem models to help inform regional fishery management council decisions? In this presentation we attempt to begin to offer an answer to this question with an empirical benthic complexity model based on a publicly available, coarse resolution (90m) bathymetry dataset. We used logistic regression to determine the best predictors of hardbottom and test the resulting models using receiver operator characteristic (ROC) curves. Finally, we discuss the two greatest sources of error in landscape-level benthic complexity models: the bathymetric dataset and the “true” observed dataset. The model will be available as part of Marine Geospatial Ecology Tools, an open-source Python-based ArcGIS 9.x geoprocessing toolbox.

H02. THE PROS AND CONS OF INTERFEROMETRIC SIDESCAN SONAR FOR COASTAL HABITAT MAPPING
David Finlayson, Gerry Hatcher, and Guy Cochrane, U.S. Geological Survey

Interferometric sidescan sonar systems simultaneously collect bathymetry and backscatter information using amplitude and phase difference information from multiple transducers. These systems offer a number of potential advantages over conventional shallow-water multibeam systems including: wider swath widths, higher across-track resolution and co-located (geo-referenced) side-scan imagery. In addition, the systems are portable and relatively inexpensive by comparison with conventional shallow-water multibeams. Interferometric sidescan systems have several disadvantages that must be weighed, however, including a greater sensitivity to vessel roll, calibration complexities introduced by variable and non-stationary transducer mountings, immature post-processing software and the inherent problems common to all sidescan sonars in imaging directly beneath the vessel.

Between March 2005 and July 2006 the USGS Western Region Coastal and Marine Geology Team conducted five shallow-water (less than 100 m depth) seafloor mapping cruises. The surveys were conducted in four different coastal areas in Puget Sound and offshore California, using four different research vessels. On each cruise the same interferometric mapping system was used to produce bathymetry and backscatter maps. In this presentation we show example data produced by the system and assess the performance of the system under real-world conditions. Finally, we present our assessment of interferometric sidescan as a portable, cost-effective, shallow-water habitat mapping technology.

H03. BENTHIC MAPPING IN APALACHICOLA BAY, FL: SUMMARY OF ACOUSTIC MAPPING TECHNIQUES AND FINDINGS
David Twichell, Brian Andrews, and Emile Bergeron, U.S. Geological Survey
Lee Edmiston, Apalachicola Bay National Estuarine Research Reserve
Bill Stevenson, Perot Systems Government Services at the NOAA Coastal Services Center

Apalachicola Bay is the largest oyster fishery in Florida, and therefore an updated map of oyster bed distribution is critical to the continued management of this resource. Shallow water depths (average depth of 3 m), size of the study area (35 km long by 8 km wide), and high turbidity combined to make this a challenging area for data collection. During 2005 and 2006, the U.S. Geological Survey in cooperation with the Apalachicola Bay National Estuarine Research Reserve and the NOAA Coastal Services Center collected 232 km2 of acoustic data from the bay. Two survey systems were used. An 8-m vessel equipped with sidescan sonar, intrerferometric bathymetry, and subbottom profiler systems was used in depths exceeding 2 m. A newly acquired Autonomous Surface Vehicle was used in water depths of 0.5-2 m. This vehicle is a 3.2-m-long remotely operated catamaran, equipped with sidescan sonar, single-beam bathymetry, and subbottom profiler. This suite of acoustic tools allowed mapping the extent of oyster beds as well as the relationship of the oyster beds to seafloor morphology and underlying geologic features. Integration of the sidescan imagery with the bathymetry shows that all oyster beds occur on bathymetric shoals, but not all shoals have oyster beds. Incorporation of the subbottom seismic data shows that most oyster beds developed on older deltaic deposits underlying the Bay. While a variety of conditions influence oyster distribution in the bay, this study demonstrates that the underlying geology has significant control on oyster distribution by providing appropriate habitat for oyster growth.

Coastal Mapping: Shoreline Change II

Kensington F

H04. FIELD- AND GIS-BASED MEASUREMENTS OF COASTAL CHANGE FOR THE SOUTHEAST CHUKCHI SEA, ALASKA
William Manley, University of Colorado
Diane M. Sanzone, Arctic I&M Program, National Park Service
James W. Jordan, Antioch University New England, Dept. of Environmental Studies
Owen K. Mason, GeoArch Alaska
Leanne R. Lestak and Eric G. Parrish, INSTAAR, University of Colorado, Boulder

Coastal environments at high latitudes are experiencing rapid change. Erosion threatens a variety of nearshore marine, terrestrial, and freshwater habitats, and may be accelerating with Arctic warming. To better understand impacts for national parks in northwestern Alaska, a collaborative study has begun to document coastal change in the southeast Chukchi Sea. This broad region includes beaches, barriers, lagoons, and tundra bluffs protected by sea ice for much of the year. A comprehensive geospatial component includes: creation of a high-resolution (0.6 m) orthophoto mosaic for 2003; rectification of aerial photography from ca. 1950 and ca. 1980; and quantitative analysis of coastline and bluff erosion. For Bering Land Bridge NP and Cape Krusenstern NM, the GIS analyses quantify complex spatial and temporal variability tied to environmental forcing, as well as a dynamic range of coastal morphologies and processes. A field-based component includes: repeat photography; mapping and description of sediments

and landforms; and periodic measurements of shoreline change since 1987 at 27 sites. The study documents that most of the ca. 400-km-long coast from Wales to Kivalina has experienced erosion in the past five decades, with long-term average rates of 0-3 m/yr. Direct impacts include beach and bluff retreat, overwash deposition, migration or closure of inlets and lagoons, capture of thaw-lake basins, and release of sediment and organic carbon to nearshore waters. Coastal ecosystems in the region appear to be sensitive to the frequency and intensity of storm events, increasing temperatures, permafrost melting, sea-level rise, and increasing length of the summer ice-free season.

H05. ASSESSMENT OF BEACH AND NEARSHORE DYNAMICS ALONG THE SOUTH CAROLINA COAST UTILIZING RTK GPS TECHNOLOGY
Clayton McCoy and Clayton A. McCoy, South Carolina Sea Grant Extension Program/Coastal Carolina University
Paul T. Gayes, Jeffery A. Marshall, and Braden M. Reynolds, Coastal Carolina University

The Beach Erosion Research Monitoring (BERM) program at Coastal Carolina University (CCU) utilizes Real Time Kinematic Global Positioning Systems (RTK-GPS) technology to assess beach and nearshore dynamics throughout coastal South Carolina. The development of RTK-GPS has modernized beach and surfzone surveying, allowing for horizontal and vertical accuracies at the centimeter level. RTK GPS surveys are conducted by setting up two GPS stations complete with an antenna, high-speed processor, and communications link, one on a known benchmark and the other typically mounted to a backpack unit or ATV. Nearshore data is collected by attaching the roving GPS unit to a boat equipped with a single beam fathometer and motion compensation instrumentation.

Profiles have been collected on an annual basis from Daufuskie Island to Waites Island for over a decade, providing coastal resources managers with an invaluable dataset to assess state-wide beach behavior. Additional data is collected at several beaches on a monthly basis. The data is used to assess spatial and temporal variability, the influences of storms, and beach nourishment projects. The profiles are also used to determine baseline and setback lines for regulatory purposes through SC OCRM (Office of Coastal Resources Management). BERM profile data is managed at CCU through an On-line Profile Management Database and is available for public use.

H06. ONLINE PROFILE ANALYSIS SYSTEM: WEB-BASED DATA LOADING, STORAGE, ANALYSIS, EXPORT, AND VISUALIZATION SITE
M. Scott Harris, Trent P. Tinker, and Eric E. Wright, Coastal Carolina University

Coastal communities benefit greatly from access to long-term coastal change data sets. With the potential for short- and long-term physical change along our coasts and the associated economic impacts, managers, decision makers, scientists, engineers and the public often need detailed access to complex and varied data sets. These data often include a wide range of data types (beach profiles, historical and recent shorelines, aerial photographs, geophysical, etc.) in their coastal region which span across decades. This specific presentation will address how we have handled and organized almost twenty years of beach profile data for the State of South Carolina, and how those data are being used by the stakeholders in the State. We have developed an online suite of tools to load, access, analyze, export, and view beach profile data in a variety of formats. If users have a specific project or are outside of South Carolina, they can create a specific region for their project, create benchmarks within that region, and load standard x,y,z,dbl (distance down line) beach profile datasets. These data can then be analyzed for various parameters, including volumes between different contours, a baseline and a contour, and volume change through time (tabular and graphic); others are currently being designed. Tools have also been developed to transfer these data into ArcGIS formats through our online ArcSDE-ArcIMS integrated geologic framework databases, providing a seamless approach to beach profile data analysis coupled with existing geologic framework data.

Land Use Planning: Restoration

Windsor Ballroom

H07. MODELING FUTURE LAND COVER CHANGE IN THE CHESAPEAKE BAY WATERSHED
Peter Claggett, U.S. Geological Survey
Claire A. Jantz, Shippensburg University, Department of Geography and Earth Science
Jim Reilly, Maryland, Department of Planning
Rob Burgholzer, University of Maryland

Restoring water quality and aquatic health in large water bodies is a lengthy process. During this process, increasing human and animal populations and changing landscapes challenge the ability of planners and land managers to successfully restore aquatic systems. Rapid urbanization and associated landscape changes have the potential to slow or even reverse restoration progress. For these reasons, managers of large scale restoration efforts should account for the impact of potential future land cover and population changes when developing and targeting restoration actions. To address this information need, the Chesapeake Bay Program Partners are developing a coupled modeling system to forecast land cover and nutrient source changes throughout the 64,000-square-mile drainage basin. The Chesapeake Bay Land Change Modeling System consists of two main components, a growth allocation model (GAMe) and a cellular automata model (SLEUTH). Together, these models serve to integrate population and employment projections with data on historic trends in forests, agricultural lands, and impervious surfaces. The modeling system is designed to simulate the impact of a variety of development policies on land use, land cover, and other nutrient sources (e.g., sewer outflows, farm animals units). The output from this modeling system will be integrated directly into the Hydrologic Simulation Program Fortran model that restoration managers are using to estimate nutrient loads to the Chesapeake Bay. This coupled modeling system is applicable to other regions in the conterminous United States because it utilizes data that are generally available nationwide.

H08. MODELING PERFORMANCE MEASURES FOR AN URBANIZED FLORIDA ESTUARY: LAKE WORTH LAGOON
Rod Braun, Palm Beach County ERM

Loss of estuarine habitat has been documented worldwide and has been correlated with anthropogenic eutrophication and the alteration of hydrology. Restoring and preserving estuarine habitat is part of the Comprehensive Everglades Restoration Plan (CERP) which utilizes performance measures (restoration targets) to complete planning activities and assess performance. Palm Beach County (Florida) Department of Environmental Resources Management has developed a methodology to model performance measures for Lake Worth Lagoon. Potential seagrass and oyster habitat is modeled using GIS resources including, bathymetry data to develop a digital elevation model, seagrass mapping from aerial photography, oyster mapping from historical resources, modeling of substrate characteristics, and water quality

parameters. A user can determine where habitat restoration is likely to occur and can assist in setting a performance measures based on these factors. Additionally, the information developed provides an effective management tool to determine where restorative and protection efforts should be focused.

H09. A WEB-ENABLED, GIS-INTEGRATED COASTAL RESTORATION INFORMATION MANAGEMENT SYSTEM
Christopher Robertson, Brad Miller, Ed Haywood, Louisiana Department of Natural Resources

The Louisiana Department of Natural Resources, Office of Coastal Restoration and Management (LDNR/OCRM) has made its coastal restoration information widely available on the internet using a web-enabled, GIS-integrated system driven by ArcIMS® software. This system combines a network of websites, a GIS database, and a coastal restoration project database called SONRIS (Strategic On-line Natural Resources Information System). The LDNR/OCRM website contains a host of background information on the state's coastal restoration program, and is located at *www.dnr.louisiana.gov/crm*. The GIS-integrated system can then be reached by selecting the link to "SONRIS Interactive GIS Map." GIS data that are available to the user include satellite imagery, aerial photography, U.S. Geological Survey quad maps, Louisiana coastal restoration project boundaries, project features, monitoring station locations, and elevation benchmarks- and with these, the user is able to generate custom maps that can be saved in a number of formats. The user can also perform a wide range of data retrievals for refining and summarizing information, and a graphing option adds to this capability. The SONRIS database, which is an Oracle®-driven relational database, catalogs the ecological data, geospatial data, and project documents that have been generated in relation to Louisiana coastal restoration projects and the Coastal Reference Monitoring System (CRMS) program. Specific types of data that have been collected include hydrographic, meteorological, vegetation, soil properties, sediment elevation, GPS survey, wildlife, and fisheries data.

Data Sharing IV

Somerset

H10. SETTING A STANDARD AND THE INVESTMENT FOR INTEGRATION OF GIS IN THE WATERSHED MANAGEMENT PROCESS
Gordon McClung, Southwest Florida Water Management District

In a world of constant change, innovative techniques have and will continue to assist in efforts to manage the water resource and floodplains. As a government agency, the Southwest Florida Water Management District (District) is asked to do more with less and downsize. To meet these challenges new techniques and innovation must provide methods and tools to properly manage the District's resources. This presentation will focus on the District's efforts: working with standards, making an investment, coordinating with federal, state, and local governments, and working with the professionals helping with management of the water resources and floodplains. To maintain and improve on information used in watershed management plans, the District has taken a number of steps over the past several years to increase the value of watershed studies. These improvements significantly enhance the District's ability to develop the high-quality, cost effective, and timely watershed information that is needed to guide regulation and management actions. Principal among these improvements is the new Geographical Watershed Information System (GWIS) a component of the District's Water Management Information System (WMIS) and the new repository of watershed parameter and model information. Another improvement is the adoption of standards for watershed management plans. These standards, used in combination with ModIS, will allow the District to maximize its investment in watershed studies.

H11. INTRODUCING THE SUWANNEE INFORMATION GATEWAY
Ellen Raabe, U.S. Geological Survey
Laura Gauron, ETI Professionals

The Suwannee River Basin and Estuary Initiative attempts to bring together agencies, researchers and the public in a multi-jurisdictional effort to model watershed and ecosystem function from headwaters to estuary. The preliminary effort is establishment of a web portal, providing access and information regarding basin resources, data and research. The Suwannee River watershed drains 26,000 km2 from southeastern Georgia to central Florida and the Gulf of Mexico. In response to a growing number of environmental threats, the Suwannee River Basin and Estuary has been identified as an ecosystem in need of protection. The Suwannee Basin Interagency Alliance in concert with the USGS has identified data integration and accessibility as primary goals for management of water and natural resources in the basin. The Suwannee Information Gateway is designed to support public outreach, decision-making, scientific research, data inquiry and ecosystem-level models. Each component of the Information Gateway serves a different need among agencies, researchers, policy-makers and citizen groups. River discharge measurements, emerging contaminants, habitats, species of concern, and demographics are made available for inquiry from one location. Preliminary assessments of population growth, land cover change and habitat vulnerability are presented in graphic form. Geographic data sets are served from an Internet Mapping System (IMS), while data inquiry tools link the visitor to Federal, State, and university research sites. Selected maps and data sets are simplified for the non-scientist in easy-to-understand formats and visualization tools.

H12. ACHIEVING FRESHWATER INFLOW RECOMMENDATION FOR MISSION-ARANSAS BAY THROUGH SPATIAL ANALYSIS
Grace Chen, Texas Parks and Wildlife Dept

To determine the optimal freshwater inflow required for maintaining ecological function of major bays, the 69th Texas Legislature mandated comprehensive studies jointly conducted by Texas Water Development Board (TWDB) and Texas Parks and Wildlife Department (TPWD). The analytical studies consist of mathematical modeling and verification processes. The modeling process performed by TWDB uses the Estuarine Mathematical Programming (TxEMP) model to prescribe target monthly inflows and the TxBLEND hydrodynamic/salinity model to estimate bay salinities resulting from each target inflow regime. The verification process carried out by TPWD evaluates the efficacy of target inflows on sustaining fishery productivity by comparing the spatial distribution of favorable salinities between modeled and observed salinity patterns. Based on observed salinity and catch rates of key fishery species collected in the Mission-Aransas Estuary, this study demonstrated how geospatial technologies, such as overlay, identify and ordinary kriging, can be used to establish spatial relationships between species abundance and the salinity gradient, which in turn can be used to determine favorable salinities for the entire bay system. Using favorable salinity patterns derived from observed long-term averages, during wet and dry periods over the past decades as baseline data, the spatial extents of favorable salinities resulting from target inflows were compared to evaluate the efficacy of each target inflow on maintaining historical fishery productivity. With the assistance of geospatial analysis, the optimal freshwater inflow regimes that satisfy different resource management objectives for the Mission-Aransas Bay can be determined.

Poster Presentations

Coastal Mapping

P01. UNDERWATER VIDEO MAPPING FOR ASSESSING AND MONITORING CORAL REEF ECOSYSTEM HEALTH
Paul Ayers and Rebecca Messer, University of Tennessee
Richard Curry, Biscayne National Park, National Park Service

Assessing and monitoring coral reef ecosystem health is essential for understanding the environmental impacts. An Underwater Video Mapping System (UVMS) is a technique to acquire Global Positioning System (GPS)-based georeferenced underwater images that allow mapping of underwater features. Using the UVMS, underwater features essential for assessing and monitoring coral reef ecosystem health can be acquired and mapped using Geographic Information System (GIS). The UVMS was used to acquire underwater images in sections of the coral reef ecosystem in Biscayne National Park (BISC). Factors contributing to the assessment of coral reef health were identified and mapped. These features include marine debris (discarded items including ropes, traps, etc.), coral damage (from boat, anchor, etc.), coral disease and other health issues (i.e. black band disease), endangered coral species, and indicator fish (fish that suggest good water quality). The UVMS is a useful tool for providing large-scale assessments of the coral ecosystem health, and identifying areas that need further detailed investigation. It also provides an opportunity to resurvey the same coral reef ecosystem and monitor health changes.

P02. DEVELOPMENT OF COASTAL FLOOD RECOVERY MAPS TO GUIDE HURRICANE RECOVERY: EXAMPLES FROM THE GULF COAST
Brian Batten, Dewberry
Maria Honeycutt, URS Corporation
Shabbar Saifee, Federal Emergency Management Agency
Gib Jones, Dewberry

In response to the severe coastal flooding caused by Hurricanes Ivan, Katrina, and Rita, including the devastation wrought by the levee breaches in and around New Orleans following Katrina, FEMA undertook fast-track projects to develop advisory flood maps for use by affected communities and citizens during the recovery and rebuilding process. Until FEMA can complete new, detailed Flood Insurance Studies and Flood Insurance Rate Maps (FIRMs) for the affected areas along the Gulf of Mexico and Lake Pontchartrain (first maps expected in mid-2007), these advisory maps fill a critical interim need for up-to-date coastal flood risk information. This presentation will explain the fast-track data collection, analysis, and GIS-based mapping techniques utilized to develop coastal flood recovery maps following Ivan (FL, AL), Katrina (MS, LA), and Rita (LA). Although the data layers and analysis techniques varied among the storms and the states affected, many aspects were shared, including depiction of coastal High Water Marks (HWMs) and a modeled storm surge inundation surface based on these HWMs. The static maps (PDFs) and GIS data were delivered via the Internet on FEMA's website (*www.fema.gov/hazard/flood/recoverydata/*), and a helpline was established to answer technical questions. Based on the authors' experiences in rolling out the maps, working with local officials, and responding to public inquiries, the presentation will also include lessons learned on the communication of coastal inundation data from the storms and the depiction of current flood risks for use in post-storm recovery.

P04. 3D PAH CONTAMINATION ASSESSMENT AT ELIZABETH RIVER, VIRGINIA
Greg Berman, Science Applications International Corporation

Single beam bathymetry, gridded with geospatial analyst, was used to determine the sediment/water interface of the historically contaminated riverbed. Chemical analyses on forty-seven cores were taken to characterize the horizontal and vertical extent of PAH contamination. A true 3d solid model was created from the sampled intervals of those cores and slices were made at different potential dredge depths. Exporting these 3d shapefiles into ArcScene 3d movies allowed display of different hotspot areas, and the desired dredge depths to remove the contamination. This approach provided a valuable tool to make educated remediation decisions that could be understood by a wide range of community participants.

P05. LASED AND USSEABED DATA MANAGEMENT AND ANALYSIS TOOLS TO ASSIST MAPPING COASTAL CHANGE OF THE GULF COAST
Shawn Dadisman, James Flocks, S. Jeffress Williams, and Jane Reid, U.S. Geological Survey
Karynna Calderon, Formerly contracted by the U.S. Geological Survey
Valerie Paskevich, U.S. Geological Survey

The U.S. Geological Survey Coastal and Marine Geology Program, in collaboration with state and academic colleagues, present two management tools to utilize decades of geologic and geophysical data collected from the Louisiana coastal zone: The Louisiana Sedimentary and Environmental Database (LASED), and usSEABED.

LASED (*http://coastal.er.usgs.gov/lased/*) contains a wide variety of data including bathymetry, sediment-core data, seafloor change images, seismic-reflection profiles, and sidescan-sonar mosaics. The database also provides a permanent online digital data-archive system that holds information for dozens of research cruises. Currently restricted to Louisiana, LASED provides a template for future development of similar databases in other regions of the Gulf Coast.

usSEABED (*http://walrus.wr.usgs.gov/usseabed/*) is a compilation of seabed characteristics throughout U.S. waters. This database contains linked datasets of analytical and numerical values derived through fuzzy-set theory application to observed geologic information, including sediment grain-size, chemical constituents, color observations, and components from numerous sources. usSEABED provides data releases that target specific geographical regions, such as the recent publication of a Data Series that covers the Gulf of Mexico (*http://pubs.usgs.gov/ds/2006/146/*).

Together, LASED and usSEABED provide researchers access to a vast amount of geologic data. These databases integrate spatial and analytical information to provide visualization and advanced query capabilities using standard GIS and Internet-browsing tools. Integration of these databases provides information necessary to develop a comprehensive assessment of coastal change along the Gulf Coast, and assist in the coastal management. Public access to these databases is via Internet Mapping Services (IMS).

P06. MULTIDIMENSIONAL ENVIRONMENTAL VISUALIZATION TOOLS
Joshua Frederickson, McLaughlin Research Corporation
Christopher Damon, University of Rhode Island
Colin Lazauski and Ryan Campbell, Naval Undersea Warfare Center

Assessing the effects of energy accumulation on the physical and biological environment are key elements of the Naval Undersea Warfare Center Division Newport Mission Environmental Planning (MEP) Program. Sound propagation from underwater acoustic sources and accumulation of energy in the marine environment can be quantified through computer modeling.

The Environmental Planning Laboratory (EPL) within the MEP Program houses resources to effectively quantify the accumulation of energy in the environment. The EPL has taken recent steps to visualize and quantify energy fields in three dimensions through a proof-of-concept project. Three-dimensional visualization of energy fields provides a more accurate representation of ensonification associated with low, mid, and high frequency acoustic sources. Physical properties of the marine environment shape the propagation of acoustic energy through the water column. Bathymetric features and benthic sediments also influence nearshore acoustic propagation. Measurement of three-dimensional energy fields in terms of volume may allow for a new approach to the analysis of effects to marine life. Advances in marine species data development more accurately depict the distribution of animals in three dimensions. These data may be coupled with energy field volumes for a more accurate assessment of impacts to species based on their true three-dimensional distribution in the water column.

P07. DEMONSTRATING THE VALUE OF CARTOGRAPHIC VISUALIZATION IN THE WAKE OF HURRICANE KATRINA

Rita Jackson and David Shaw, GeoResources Institute, Mississippi State University
Jeff Ballweber, Department of Agricultural and Resource Economics, Colorado State University

Cartographic visualization is a means of communicating to the public complex site-specific events and data, and is especially valuable during catastrophic events such as Hurricane Katrina. Cartographic visualization was used in the early stages of Katrina response to integrate and link geospatial technologies to provide meaningful information to the public and directly supported relief efforts. Despite all the advance planning and emergency management systems in place, imagery and cartography were essential to present the “real picture” to the impacted public and to support on-the-scene responders. In short, federal, state and local emergency management personnel needed a map, a cartographic product, to understand the situation and more effectively aid those in need. This is best illustrated by the Hurricane Katrina Resource Locations map. This map was an invaluable visualization tool in that it showed the locations of the FEMA regions, emergency response teams, incidents management teams, along with personnel in command. The map was developed during the critical first weeks following Katrina and regularly updated with current data. A total of fifteen updated maps were generated confirming their visualization value. Cartographic visualization can also be used proactively in Decision Support Tools such as the Community Vulnerability Assessment Tool from the NOAA Coastal Services Center. Communities can use this tool to identify areas and critical resources that are most vulnerable to natural disasters. Cartographic visualization products developed from this tool can assists local officials and the public in understanding and evaluating alternative scenarios to minimize their vulnerability to future catastrophic natural disasters.

P08. VISUALIZING THE IMPACT OF A WIND TURBINE FACILITY ON THE VIEWSHED OF ASSATEAGUE ISLAND NATIONAL SEASHORE

Arthur Rodriguez, Carl Zimmerman, Andrew Roach, and Courtney Schupp, Assateague Island National Seashore

As the demand and cost of fossil fuels increase, the popularity of wind turbine facilities in the United States continues to rise. Although no formal proposals have been submitted, some discussions have recently taken place concerning the installation of such a facility off the coast of Assateague Island National Seashore. These wind turbines can be 100’s of meters tall, and the location, size, and number of turbines could severely impact the natural viewshed of the National Seashore. As a result, investigations into these impacts have begun through the use of visualization and GIS software. WindPro, which is wind turbine software designed by the Danish company EMD, was recently purchased and is currently being utilized to create a visualization of wind turbines on landscape digital photographs. Lidar elevation data and viewshed tools within ESRI ArcGIS software are also being used to determine which areas within the Seashore would be most affected by potential locations of the wind turbine facility. These methods will allow research managers at Assateague Island National Seashore to visually and specifically demonstrate the effect a wind turbine facility would have on the natural viewshed.

P09. SONAR MAPPING OF THE FLORIDA-HATTERAS SHELF-BREAK AND CHARLESTON BUMP FAULT SCARP

Christopher Stubbs and Leslie Sautter, College of Charleston
Scott Harris, Coastal Carolina University

As part of the College of Charleston’s (CofC) Transect Program, research cruises conducted aboard the R/V *Savannah* of the Skidaway Institution of Oceanography and the NOAA Ship *Nancy Foster* have explored and sampled several localities within the central portion of the South Atlantic Bight, the continental shelf region between Florida and Cape Hatteras, NC. Klein sidescan and Kongsberg multibeam sonar arrays collected seafloor images and bathymetric data that were processed by CofC undergraduate geology researchers using Caris HIPS/SIPS software. Several of the data sets have been ground-truthed using sediment grabs, footage from ROV cameras, and SCUBA videography. Two of the prominent seafloor features discovered are (1) an outcropping hard-ground shelf-edge structure approximately 650 by 150 m, with 10 m relief. It is oriented parallel to shore in water depths of 60 m. Possible geological and biological influences on the structure’s origin and morphology are being explored; and (2) a meandering river channel located on the mid-shelf, where water depth is approximately 22 m. Rock and sediment samples as well as video documentation of this feature reveal a channel with 1.5 m of relief, cut into the hard-ground, and includes coarse sands and abundant river pebbles. Additional shelf hard-ground features will be presented.

P11. THE MASSACHUSETTS SEAFLOOR MAPPING PROGRAM: INITIATING THE PROJECT TO APPLYING RESULTS

Anthony Wilbur, Massachusetts Office of Coastal Zone Management
Walter A. Barnhardt, U.S. Geological Survey
Seth D. Ackerman and Susan Snow-Cotter, Massachusetts Office of Coastal Zone Management

The Massachusetts Office of Coastal Zone Management (CZM) and United States Geological Survey (USGS), Woods Hole, initiated the Seafloor Mapping Cooperative in 2003 to address the need for acquiring datasets on the spatial distribution of benthic resources to help resource management. The goal of the cooperative is to comprehensively map the seafloor in Massachusetts. The program is a success story in partnership, funded ($3.5 million – to date) by a combination of state, federal (USGS and NOAA) and private sector contributions. The partnership is effectively leveraging expertise, funding, and technology within state and federal agencies. Seafloor maps are complete or in stages of preparation for Ipswich Bay (Cape Ann to Salisbury), North Shore (Gloucester to Nahant), Boston Harbor, South Shore (Hull to Duxbury), western Cape Cod Bay, and eastern Cape Cod. Mapping in Massachusetts waters seamlessly meshes with existing seafloor charts from western Massachusetts Bay, Stellwagen Bank, and Jeffreys Ledge. These mapping efforts reveal the complexity of the seafloor landscape and are a large step toward a greater understanding of seafloor habitats. Furthermore, seafloor maps are facilitating better management of ocean resources and stimulating research. This poster will: (1) demonstrate the necessity of partnerships to accomplish large-scale mapping and leverage resources to advance results, (2) describe the education and outreach strategy to ensure mapping results are useful, (3) explain current and future applications of mapping data to resource management, and (4) identify next steps in the mapping collaborative.

P12. DATA ACQUISITION PROGRAM STATUS FOR MAPPING OF CALIFORNIA'S WATERS
Jerry Wilson, Fugro Pelagos
Rikk Kvitek, California State University, Monterey Bay

A specialist team comprising academic, industry, and government members is underway in a program that will ultimately lead to mapping of all of California's State Waters from MHHW out to the three-nautical-mile boundary. The team is lead by the Seafloor Mapping Lab of California State University, Monterey Bay, and includes Principal Investigators from Fugro Pelagos, Inc; the U.S. Geological Survey's Coastal and Marine Geology Program; and Moss Landing Marine Labs' Center for Habitat Studies. This presentation describes the comprehensive and high-resolution seafloor mapping program, and reports on the current data acquisition and processing results. The program includes data acquisition followed by a three-tier level of data processing and analyses. The mapping systems include the latest multibeam echosounding and airborne LIDAR bathymetry systems. Other field data acquisition provides groundtruth data such as running video transects and sampling. First-tier data examples will be presented as examples of the program's acoustic and LIDAR results. The first portion of the California coast now being mapped extends from Stinson Beach, just north of the Golden Gate, southward to Punta del Año Nuevo. This area was identified as a high priority during a workshop attended by statewide stakeholders. Implemented by the SFML, the workshop's prioritization processes and results are described. This ground-breaking program is funded by the California State Coastal Conservancy and the California Ocean Protection Council. The program manager is the Monterey Bay Sanctuary Foundation, working in collaboration with NOAA's National Marine Sanctuary Program.

P13. MARINE PROTECTED AREA PLANNING IN CALIFORNIA SUPPORTED BY A GIS-BASED DECISION SUPPORT SYSTEM
Will McClintock, University of California at Santa Barbara
Mary Gleason, The Nature Conservancy
Paulo Serpa, California Department of Fish and Game

The California Marine Life Protection Act (MLPA) calls for the establishment of a managed network of marine protected areas (MPAs) for the state of California. The MLPA Initiative, a collaboration between the Resources Legacy Fund Foundation and the California Department of Fish and Game, has organized a group of scientists and specialists in Geographic Information Systems (GIS) to enable the MLPA process. Here we detail the MLPA GIS decision support system designed and implemented by our group, including (1) the data gathered and synthesized by our technicians and scientists, (2) a geodatabase, (3) web maps, (4) custom web-based decision support tools, and (5) terminal services for running ArcGIS and custom Model Builder tools. As California will be the first state in the union to implement a managed network of MPAs, our GIS based decision support system may serve as a model system for similar efforts in other state or federal processes.

P14. USING GIS TO DEVELOP A DIGITAL SURFACE MODEL OF THE SOUTH TEXAS PLEISTOCENE
Tami G. Beyer, Texas A&M University-Corpus Christi
Elizabeth H. Smith, Center for Coastal Studies

The Gulf of Mexico Late Pleistocene shoreline featured expansive drainage systems and incised river valleys as a result of extensive glacial-fluvial processes occurring from the Wisconsinan meltwater. Several South Texas geologic studies in the Coastal Bend identify ancient buried river systems that extend beneath the modern submerged continental shelf, indicating an exposed paleo-shelf and a sea level low-stand. The objective of this study was to assess these studies and create a 3-D visualization coastal management tool using Geographic Information Systems (GIS) to better represent the ancient regional topography. Over 250 studies within the study area reference data or detailed maps regarding the sea-level low-stand and the buried channels. A geodatabase was developed to organize and review the literature for related paleo-datasets and to provide an efficient means of accessing any information that would help characterize the ancient environment. A digital surface model interpretation of the Pleistocene-Holocene unconformity was created by interpolating depth data from the geodatabase. Data was not commonly available at a regional scale from a single study; therefore, multiple large-scale study datasets were also interpolated to create a regional surface. Paleo-data from the Minerals Management Service is currently being processed for study integration. Kriging interpolation was the best method for processing localized datasets, while a Triangulated Irregular Network (TIN) was the best-method to generate the broad-scale paleo-surfaces. The surface results were visually compared to the literature source maps for analysis and also evaluated with modern DEMs using spatial arithmetic to quantify the regional coastal change since the Pleistocene.

P15. A MIX OF OLD AND NEW: KACHEMAK BAY RESEARCH RESERVE HISTORIC EROSION RATES MAPPING PROJECT
David Gann, State of Alaska, Department of Natural Resources

The Kenai Peninsula Borough with the help of the Kachemak Bay Research Reserve is conducting a shoreline mapping effort to map shoreline erosion rates. The project will use historical aerial survey photographs to estimate the position of beach bluffs from the City of Homer to the East Forelands, through time. Imagery from 1951, 1975, and 1996 will be georectified and aligned. Once the images are rectified, and historical data is considered (including the 1964 earthquake), the imagery will be incorporated into a GIS layer and the coastline will be drawn in ArcView. This project is designed to develop a regional understanding of coastal change hazards along the Kenai Peninsula coastline and estimate historical erosion rates. The erosion estimate maps will also be used to predict future trends, as well as to focus research on the specific processes that cause erosion. Coastal erosion along the Kenai Peninsula coast is estimated at 1 to 3 feet per year but, until now, there has not been an effort to map this coastal hazard. Roads and houses have been lost to erosion, and erosion severely impacts property values. This project mixes historical and modern technology. It provides a unique example of how one Alaska district is addressing the coastal hazard needs of its communities using GIS as a valuable tool to manage local resources.

P16. TEMPORAL AND EPISODIC BEACH CHARACTERIZATION ALONG THE ALABAMA GULF COAST
Stephen Jones and Phil Patterson, Geological Survey of Alabama

The Coastal Resources Section, part of the Geological Survey of Alabama's Geological Investigations Program, collects, archives, and disseminates information on coastal resources to further the public's understanding of geomorphic change, environmental quality, land use, and other environmental indicators affected by natural and anthropogenic influences. One focus of the Coastal Resources Section is to document and assess episodic and temporal shoreline change. Within the past few years, Alabama's coastline along the Gulf of Mexico has been significantly altered by both natural and anthropogenic processes. In recent years, tropical cyclones, such as Hurricanes Ivan (September 2004) and Katrina (August 2005), have caused unprecedented damage to habitat, recreational beaches, and infrastructure. Two large-scale beach nourishment projects were completed prior to the landfall of Hurricane Ivan. The Gulf Shores, AL, Beach Restoration Project and the West Beach Gulf Shores Emergency Beach Fill Project were completed in 2001 and 2003, respectively. Following Hurricane Katrina, the Orange Beach/Gulf State Park/Gulf Shores 2005-2006 Beach Restoration Project was completed in May 2006. Methods of investigation include the collection, development, and dissemination of high-

resolution coastal imagery and supporting thematic layers, shoreline change analyses (basic surveying techniques, aerial photographic interpretations, and statistics), and the implementation of GIS models to examine airborne laser altimetry, historic shoreline vectors, and other survey data. These studies help us to further understand and document the process-response mechanisms along the Alabama coastline.

P17. FIFTY-FOUR YEARS OF SHORELINE CHANGE ALONG THE CHUKCHI SEA NEAR BARROW, ALASKA

Leanne Lestak, William F. Manley, Cove M. Sturtevant, and James A. Maslanik, University of Colorado

There has been increasing interest in processes affecting Arctic coastlines, including shoreline change, flooding, and sediment loading. Isolated coastal communities are more vulnerable as populations expand and climate changes. Decision makers require detailed analyses to better protect their populace. Documenting and understanding spatial and temporal variability in change rates are increasingly attainable as high-resolution imagery becomes available, and as GIS and remote-sensing tools are more widely accepted. This study presents such an analysis for 32 kilometers of the Chukchi coastline near Barrow, Alaska. Coastal areas at this latitude are protected by sea ice approximately 9 months of the year. GIS and surveyed shoreline data were utilized for a quantitative analysis of coastline and bluff change. The geospatial data include: a high-resolution (0.7 m) QuickBird satellite image, a corresponding elevation model, and radar image (5 m) for 2002; rectified aerial photography from 7 time slices (1948, 1955, 1962, 1964, 1979, 1984, and 1997); and GPS shorelines for 5 days in 2001. Environmental forcing and human impact drive coastal change in the Barrow area. The long-term mean shoreline erosion rate is -0.05 m/yr. Inter-year mean change rates vary from -1.0 m/yr (erosion) to 1.41 m/yr (accretion). Bluff top long-term average erosion rates are –0.21 m/yr. Direct impacts include decrease of beach width, flooding, and loss of buildings and critical infrastructure in eroded areas. The coastal system appears to be sensitive to the frequency and intensity of storm events, increasing temperatures, permafrost melting, sea-level rise, and increasing length of the summer ice-free season.

P18. PRESLEY CREEK SHORELINE CHANGE SUMMARY

Donna Milligan, Christine A. Wilcox, and C. Scott Hardaway, Jr., Virginia Institute of Marine Science

Presley Creek is a small tidal creek located on the Potomac River in Northumberland County, Virginia. The Shoreline Studies Program analyzed site conditions to answer two basic questions: What is the history of Presley Creek in regard to inlet movement and littoral drift? and did a channel exist at the isthmus, the connection from the mainland to the creek mouth peninsula before 1937? To understand the history of the creek, historical and recent orthorectified and geo-rectified aerial images were used to provide snapshots of the shore reach through time. Inlet movement was determined using the digitized shorelines. Charts from 1776 and 1863 were used as additional references. While the 1776 make could not be corrected into GIS, the 1863 was georectified using ground features. Information from NOAA, which quantified the difference between the chart's assumed datum and NAD83 allowed us to have confidence in our earliest shoreline when it was overlain on later dated shorelines. A series of photos taken in the 1990s and 2000s were georectified to show the most recent changes to the inlet particularly its response to Tropical Storm Ernesto that impacted the region on September 2, 2006, with +6 ft MLLW surge and 35 knot sustained winds and 55 knot gusts. Through this process, we were able to answer the posed questions: Geomorphic evidence shows that the net sediment drift is westward; and an active inlet at the position of the present day isthmus or causeway has not occurred in the last 143 years.

P19. DEFINING INLET HAZARD ZONES FOR REGULATORY PURPOSES USING HISTORICAL SHORELINE ANALYSIS

Kenneth Richardson, Jeffrey Warren, and Patrick W. Limber, North Carolina Division of Coastal Management

The establishment of Areas of Environmental Concern (AECs) forms the foundation of the North Carolina Coastal Resources Commission's (CRC) permitting program for regulating coastal development. The Inlet Hazard AEC boundaries were originally established in 1979 using aerial photography diapositives to create a time series of historical shoreline positions defined along shore-perpendicular transects at 300-foot intervals. The landward-most 99% confidence interval projected 10 years forward was established from best-fit curves of linear and quadratic regressions of these data. A new methodology developed by the CRC Science Panel and the NC Division of Coastal Management achieves a higher degree of accuracy using orthophotography, NOS T-sheets, and GIS-based spatial analysis. Statistical shoreline trends in these digital datasets are defined at shore-perpendicular transects evenly spaced at 50-m (164-ft) intervals. Both the rate of change (linearly regressed) and standard deviation at each transect are used to establish the point along the oceanfront shoreline where inlet-related hydrodynamics no longer dominate other coastal processes. This point is the shore-parallel extent of the AEC. The landward (shore-perpendicular) extent of this polygon is established from this point inlet-ward using a combination of average and maximum beach width of the landward-most position (i.e., worst-case scenario) of all shoreline data unique to each transect. Lateral migration or oscillation trends and rates, geomorphology, and human interference (e.g., dredging, channel relocation, engineered structures) are also considered. The new AEC boundaries mitigate risk by managing development by more accurately defining the portions of barrier islands under direct influence of inlet-related processes.

P20. FERRYMON: USING FERRIES TO ASSESS ENVIRONMENTAL CHANGE IN NORTH CAROLINA'S NEUSE RIVER AND PAMLICO SOUND SYSTEM

Rodney C. Guajardo, Hans W. Paerl, and Alan R. Joyner, University of North Carolina, Chapel Hill, Institute of Marine Sciences
Joseph R. Ramus, Duke University Marine Laboratory

North Carolina's Albemarle-Pamlico Estuarine System (APES) is the U.S.'s second largest estuary and a critical habitat for its southeastern Atlantic fishery. Two ferries that traverses the Pamlico Sound and one ferry that traverses the Neuse River have been equipped with a flow-through system that includes a multi-probe sensor and an automated water sampler to assess surface water quality trends. This program, FerryMon (*www.ferrymon.org*), provides temperature, salinity, pH, dissolved oxygen, turbidity, and chlorophyll a fluorescence data in a near real-time manner. Intensive temporal and spatial data obtained from the ferry routes provide an environmental baseline and are used to assess the patterns and variability in surface water hydrography, nutrients, phytoplankton biomass, and composition, including potentially harmful taxa. FerryMon is evaluating ecosystem-level responses to anthropogenic nutrient enrichment and environmental perturbations, including hurricanes which frequent this region. FerryMon is being used to calibrate remote coastal ocean color sensors, and its data output is used to develop, calibrate, and validate mechanistic and probabilistic water quality models for the Pamlico Sound System. FerryMon provides a model system for assessing water quality over a wide range of spatial and temporal scales for large estuarine and coastal systems that are crossed by ferries.

P21. APPRAISAL OF TIME-SERIES (1926-2006) BATHYMETRIC EVOLUTION AT A COASTAL INLET AFTER CHANNEL-EDGE GROYNE EMPLACEMENT USING A GIS: A CASE STUDY FROM THE GIPPSLAND LAKES, VICTORIA, AUSTRALIA

Peter Wheeler and James A. Peterson, Monash University

The relative significance of environmental and engineered changes during the last 80 years (1926-2006) of flood-tide delta build-up at the artificial entrance area of the Gippsland Lakes (Victoria, Australia) can be gauged from results of detailed time-series analysis of hydrographic data. Visualisation refines the “masking process” for cut-and-fill computation in the service of documenting the interaction between flood-tide build-up, and the evolution of the flood and ebb-tide channel across it, in relation to three en echelon groynes that have failed to meet their designed purpose: the enhancement of ebb-tide flow for navigation channel maintenance. Explanation for this situation lies partly in the departure of the groyne field installation from an original 1927 design, and also in the positive feedback between flood-tide delta build-up and steady reduction in freshwater input to the Gippsland Lakes due to inter-regional water transfer and climate change.

P22. DEVELOPMENT OF HIGH-RESOLUTION COASTAL DEMS: SEAMLESSLY INTEGRATING BATHYMETRIC AND TOPOGRAPHIC DATA TO SUPPORT COASTAL INUNDATION MODELING

Barry Eakins, Lisa A. Taylor, Kelly S. Carignan, Robin R. Warnken, and Tatiana Sazonova, National Geophysical Data Center

The National Geophysical Data Center (NGDC), an office of the National Oceanic and Atmospheric Administration (NOAA), is under contract to the Pacific Marine Environmental Laboratory (PMEL) NOAA Center for Tsunami Research to develop high-resolution digital elevation models (DEMs) of combined bathymetry and topography. The coastal DEMs will be used as input for the Method of Splitting Tsunami (MOST) model developed by PMEL to simulate tsunami generation, propagation, and inundation. The DEMs will also be useful in studies of coastal inundation caused by hurricane storm surge and rainfall flooding. We present our methodology for creating the high-resolution coastal DEMs, typically at 1/3 arc-second (~10 meters) cell size, from diverse digital datasets collected by numerous methods, in different terrestrial environments, and at various scales and resolutions; one important step is establishing the relationships between various tidal and geodetic vertical datums, which may vary over a gridding region. We also discuss problems encountered and lessons learned, using the Myrtle Beach, South Carolina DEM as an example.

P23. STATUS AND PLANS FOR USGS/NOAA TOPOGRAPHIC/BATHYMETRIC MERGED DATASETS

Dean Tyler, Science Applications International Corporation

The U.S. Geological Survey (USGS) and the National Ocean Service (NOS) of the National Oceanic and Atmospheric Administration (NOAA) are collaborating in the development and production of merged topographic/bathymetric datasets. A critical aspect of this work is the vertical accuracy achieved through the incorporation of the datum conversion software and transformation grids made available by the VDatum software tool that was developed jointly by NOAA’s Office of Coast Survey (OCS) and the National Geodetic Survey (NGS). The VDatum tool enables analysts to transform coastal elevation values among 28 different vertical datums. Merged datasets have been completed for five of the eight states for which VDatum transformations are currently available: Delaware, Florida, Louisiana, California, and Washington. Plans to complete topographic/bathymetric merged datasets for the remaining three states areas are being developed. Periodic enhancements are made to the existing datasets.

Data Sharing

P24. DMS DATA MANAGER GIS TOOLS APPLICATIONS IN NORTH CAROLINA

Alexandra Carvalho, Taylor Engineering Inc.
John W. McCormick, U.S. Army Corps of Engineers, Wilmington District

The Diagnostic Model System (DMS) methodologies and the Data Manager GIS tools provide waterway managers, engineers, and waterway operations and maintenance (O&M) personnel with ways to organize historical and recent navigation channel project information, as well as with quick, inexpensive, and reliable methods to evaluate emerging and recurring channel shoaling problem areas. Project information generally managed with the DMS system includes channel information and geometry, recent and historical waterway bathymetric data, shoaling areas, and dredging events. Three case studies in North Carolina demonstrate the application of the DMS methods and tools.

P25. SJRWMD ARC HYDRO: COMMUNITY-BASED DATA SHARING AND WATER RESOURCES MODELING WITH ARC HYDRO

Sandra Fox, St. Johns River Water Management District
Stephen Bourne, PBS&J
Aisa Ceric and Christine Mundy, St. Johns River Water Management District

One of five water management districts in Florida, the St. Johns River Water Management District (SJRWMD) is responsible for managing ground and surface water supplies in all or part of 18 counties in northeast and east-central Florida. The district has established a program for community based water resources modeling and information sharing. At the heart of the program is a district-wide Arc Hydro (AH) geodatabase. First created by the district’s Surface Water Quality Monitoring (SWQM) program to better define the drainage areas for 73 water quality monitoring sites, the AH database has evolved into a full information system that comprises an enhanced version of the national standard Arc Hydro schema and a custom set of tools that enable users to explore, build, quality control, and use the hydrologic data as the bases of water resources models. The tools also provide the ability to catalog models from the spectrum of water resources modeling efforts on-going at the district. The toolset provides the potential for extending the SWQM AH application to other District programs, and provides a mechanism for incorporating specialized or more detailed knowledge about water resources into the District-wide AH program, making that knowledge more easily accessed by all. With this community-based information sharing system in place, the district now is turning its attention to specific applications that both make use of and contribute to the system. Specifically, due to its unique proximity to the ocean, the district is focusing on coastal characterization by way of the Arc Hydro data model.

P26. ARC HYDRO AND THE COAST IN NORTHEAST FLORIDA: EXTENDING ARC HYDRO BEYOND A CLASSIC DENDRITIC DRAINAGE PATTERN

Sandra Fox, St. Johns River Water Management District
Clay Montague, University of Florida, Gainesville, Dept. of Environmental Engineering Sciences
Aisa Ceric and Palmer Kinser, St. Johns River Water Management District
Stephen Bourne, PBS&J

An Arc Hydro (AH) geodatabase was developed for the St. Johns River Water Management District (SJRWMD) in northeast Florida to better define the drainage areas for 73 water quality monitoring sites in the Surface Water Quality Monitoring (SWQM) program. The geodatabase contains a geometric network, primarily representing surface water flow, with relationship classes for features of hydrologic significance, and was constructed with the assistance of the Division of Engineering’s hydrologist. The resulting geodatabase and SWQM AH (vector) generated drainage areas are effective for inland areas, with modifications from the standard AH

schema for areas that do not contribute to surface water flow, and for sinks and springs. AH was designed for classic dendritic flow patterns, not the norm for much of coastal Florida. The coastal extent of the SJRWMD area includes 10 Atlantic Ocean inlets and the Intracoastal Waterway (ICW). As a "workaround" in AH, a set of hypothetical "TidalNullPoints" were created, situated along the ICW at the approximate location of divergent flow on the outgoing tide; the position is static and results in no representation of the tide. Eighteen of the 73 SWQM sites are located in waters influenced by the tide; of these 5 are associated with the ICW and 13 are within rivers, representing two different problems for AH application. The SWQM program developed a set of Watershed and Water Quality Fact Pages (*www.sjrwmd.com/archydro/*), demonstrating the utility of the AH approach to representing and accessing water resources data in GIS. This talk will focus on the nature of, and proposed solutions to, the AH coastal application problem.

P27. WATERSHED DATABASE AND MAPPING PROJECT FOR VIEQUES ISLAND, PUERTO RICO

George Graettinger, Michele Jacobi, and Benjamin Shorr, NOAA's Office of Response and Restoration
Jill Bodnar, Genwest Systems

NOAA's Assessment and Restoration Division (ARD) produces integrated Watershed Database and Mapping Projects for coastal watershed areas impacted by the release of toxic chemicals from both hazardous waste sites and non-point sources. As part of NOAA's support to the clean-up of Vieques, Puerto Rico, ARD is developing a Watershed Project focusing on the potential impacts of past military practices on and around Vieques. The project combines contaminant data with geospatial data to assist in establishing management priorities for cleanup in addition to characterization and assessment of potentially impacted NOAA trust resources. Sediment, soils, surface water, groundwater, and tissue chemistry from NOAA and the U.S. Navy have been incorporated into NOAA's Query Manager database. Query Manager is a freely downloadable relational database and query engine that allows users to query contaminant and toxicity studies for site specific or island-wide areas. Sediment, soil, and WQ criteria have been incorporated into Query Manager to provide comparison of contaminant concentrations and potential criteria exceedance and to facilitate assessment of ecological risk to NOAA resources in the region. Users can import these data into a GIS based Watershed Project to view the contaminant data in context of a wide variety of geographic information compiled for the project, including former military activities, terrain, hydrology, habitat, and species distribution. The project also includes an internet mapping site *(http://mapping.orr.noaa.gov/website/vieques/viewer.html*) and a HTML Watershed Guide, which provides detailed project history and objectives, and user guides for applications and tools, metadata, and related Internet websites.

P28. BATCHED PROCESSING OF SATELLITE OCEANOGRAPHY AND ARGOS TRANSMISSIONS IN ARCGIS

Jason Roberts, Duke University

ESRI's ArcGIS is the dominant desktop GIS package, but several deficiencies made it historically unsuitable for many coastal and marine ecology studies. Notably, it could not read the primary formats used for remotely-sensed oceangraphic data, predominantly HDF and NetCDF, and did not include tools for batch processing, making analysis of time-series data difficult without programming. ArcGIS 9.2 partially addresses these problems but is still missing many of the capabilities needed by coastal and marine researchers. In this session I will present a set of geoprocessing tools for working with oceanographic data in ArcGIS 9.x. Using these tools, researchers can build geoprocessing models that perform many tasks essential to spatially explicit coastal and marine studies. Important capabilities include: conversion of oceanographic satellite data from native formats to ArcGIS raster format, sampling of rasters using time series data, production of derived oceanographic products using published methods such as the Cayula-Cornillon algorithm for identification of SST fronts, importing of Argos satellite telemetry to GIS points, and invocation of all tools in a data-driven, batch processing mode that is more flexible than the batched processing user interface in ArcGIS 9.2. My presentation will include usage examples from recent research projects. These tools are part of a larger package of open-source, Python-based ArcGIS 9.x geoprocessing toolbox called Marine Geospatial Ecology Tools.

P29. XSTORMS: A GEODATABASE SYSTEM FOR COASTAL CHANGE INFORMATION

Charlene Sullivan and Janice Subino, ETI Professionals, Inc., contracted by USGS Florida Integrated Science Center
Dennis Krohn and Shawn Dadisman, U.S. Geological Survey, Florida Integrated Science Center

The U.S. Geological Survey, Center for Coastal and Watershed Studies, has developed a geodatabase system to manage, share, and archive recent digital and analog data collected from the coastal zone before and after extreme storm events. The XSTORMS (eXtreme STORMS) geodatabase consists of extreme storm data including oblique aerial photographs and videos of the coast, and supporting meteorological data provided by agencies such as the National Weather Service and the National Hurricane Center. XSTORMS integrates numerous data types and provides data processing and visualization capabilities to multiple users using standard GIS and Internet-browsing technologies. All data are spatially linked so that pre- and post-storm comparisons can be quickly made and the results shared electronically. Centralized data storage, routine backups, and consolidated offsite storage ensures the integrity of the geodatabase. XSTORMS is an internal project resource and analysis tool used to facilitate USGS research efforts in the coastal zone. Coastal changes, such as beach, dune, and sea-cliff erosion that occur during extreme storms, pose significant hazards to buildings and infrastructure that impinge on vulnerable shorelines. The capability to improve predictions of coastal change will facilitate locating buildings and infrastructure away from coastal change hazards.

Habitat Mapping

P32. ASSISTING PELAGIC MARINE TURTLE HABITAT RESEARCH WITH GIS AND REMOTE SENSING

Robert Hardy and Blair E. Witherington, Florida Fish and Wildlife Conservation Commission

Characterization of pelagic habitat used during critical developmental life stages of marine turtles requires integrating remote sensing and Geographic Information Systems (GIS) technologies. The deficiency of ecological accounts of this ecosystem is a testament to the difficulties of such research. Fourteen years of pelagic research conducted by the Florida Fish and Wildlife Conservation Commission (FWC) has documented open-ocean juveniles of 4 of the 5 marine turtle species known from Florida. The effort aims to describe the ecology of pelagic stage marine turtles in the Atlantic Ocean and Gulf of Mexico around Florida. Targeted habitats (known as epi-pelagic drift communities) are characterized by floating lines of macroalgae (dominated by *Sargassum spp.*), debris (of natural and anthropogenic origins), as well as toxicants (oil, tar, etc.). These drift lines typically occur near boundaries (or eddies spun off) of the Loop Current and Gulf Stream. Surface winds and circulation arrange flotsam into linear aggregations of habitat used by developing turtles as well as invertebrates and fishes (many of commercial importance). Remotely sensed data could ease the challenges associated with locating this ephemeral habitat by quantifying the factors conducive to its formation. Experimental observations of available oceanographic data (sources: NOAA-AOML, NASA-JPL, NAVOCEANO) suggest a connection between drift habitat occurrence and locally significant changes in surface temperature or circulation speed and direction. This parallel further suggests generative factors can be described via remote sensing and thus, possibly predicted. We hope to refine our GIS with more

appropriate remotely sensed oceanographic data, with the initial goal of suggesting productive destinations for future research expeditions. Upon project completion, capture data would be incorporated, yielding insights toward the extent developing turtles use drift habitat. This effort has numerous management implications, namely its inclusion into marine hazardous material emergency response plans.

P34. USING IMAGE PROCESSING METHODS WITH RASTER EDITING TOOLS FOR MAPPING EELGRASS DISTRIBUTIONS IN PACIFIC NORTHWEST ESTUARIES
Patrick Clinton and David R. Young, U.S. Environmental Protection Agency

False-color near-infrared (CIR) aerial photography of seven Oregon estuaries was acquired at extreme low tides and digitally orthorectified with a ground pixel resolution of 25 cm to provide data for intertidal vegetation mapping. Exposed, semi-exposed, and some submerged eelgrass meadows were clearly imaged. Three-band Soil-adjusted Vegetation Index (SAVI) derived image processing algorithms were applied to the orthoimagery. The images were further processed with unsupervised isoclassification into seven statistically distinct isocluster raster layers. Each isocluster layer was converted to a binary raster and edited using on-screen raster editing tools following traditional photo-interpretation methods using the original orthophotography as an overlay. Once edited, the isocluster rasters were recombined to form the eelgrass classification. This method proved to be effective in distinguishing intertidal vegetation from non-vegetated areas with overall accuracy assessments by individual estuary ranging between 79 and 100 percent. This method combines vegetation classification in digital image processing, raster editing tools and photo-interpreter guidance to produce maps less spatially generalized than manual methods, and more accurately classified than automated digital processing methods. Remotely sensed data derived with this hybrid classification method have promising uses in areas where relatively high levels of data precision and accuracy are required, such as in estuarine ecological analyses and coastal resource management.

P35. AIRBORNE MAPPING OF INTERTIDAL OYSTER BEDS OF SOUTH CAROLINA'S COAST UTILIZING AUTOMATED FEATURE EXTRACTION TECHNIQUES
David Loy and Gary Florence, Photo Science Inc.

South Carolina's coastal zone contains over 570,000 acres of wetlands and estuarine habitat that include marshlands, tidal creeks, rivers, and sounds. Intertidal oysters (*Crassostrea virginica*) are dispersed throughout most of the State's coastal wetlands with approximately 2,000 acres of oyster beds growing along shorelines and on open flats exposed at low tide. Oysters are an important coastal resource to the state and serve many essential functions in the environment such as water filtration, creek bank stabilization, and the providing of habitats for many plants and animals. The current intertidal oyster reef database for South Carolina was developed by detailed field assessment over several years. This database was completed in the early 1980s and is in need of an update to assess the overall health of the current resource and trends spanning the state's coastal zone. Photo Science has deployed various methodologies to map the spatial extent and to determine various class distinctions of the oyster strata using airborne imagery. This presentation represents a continuation of work presented during the poster session at the GeoTools conference in 2005. Using semi-automated feature extraction and image processing techniques, Photo Science has successfully determined presence/absence and spatial extent of the oyster strata. Ongoing efforts to also determine the percentage of each bed that have vertically complex shell matrix within individual beds have proven more challenging to accurately discern from the source imagery. This presentation will discuss the various methodologies deployed, successes, limitations and recommendations for problem resolution.

P37. DISTRIBUTION OF EELGRASSES AND MACROALGAE IN PADILLA BAY, WASHINGTON IN 1989, 2000, AND 2004
Suzanne Shull, Washington Department of Ecology
Douglas Bulthuis, Padilla Bay National Estuarine Research Reserve

The distribution of eelgrasses, macroalgae, and salt marshes in Padilla Bay have been mapped in the past (Bulthuis 1995, Shull 2000) but there are no studies monitoring the seasonal and year to year changes in the extent and distribution of these communities, nor in monitoring long-term trends in the distribution of these vegetative communities. Eelgrasses are ecologically important, particularly in Padilla Bay; approximately 17% of all the eelgrass in Puget Sound is located in Padilla Bay (3-4000 ha). Two goals of this study were: to develop and test methods that can be used in a long-term monitoring program of submerged vegetation in Padilla Bay and to determine the distribution and composition of eelgrasses and macroalgae in Padilla Bay in summer 2004. The vegetated areas were on-screen digitized and attributed using a Personal GeoDatabase schema (ESRI). The interpretation was based on more than 1300 ground truth points. The resulting map was then compared to previous maps of Padilla Bay from 1989 and 2000.

P38. THE MAPCOAST PARTNERSHIP: USING SEDIMENT PROFILE IMAGERY (SPI) TO CHARACTERIZE SHALLOW BENTHIC HABITATS AND ASSESS THEIR CONDITION
Emily Shumchenia and John King, University of Rhode Island
Giancarlo Cicchetti, U.S. Environmental Protection Agency

Collecting benthic biological data in densities high enough for creating useful habitat maps is a challenge for shallow water mapping efforts. The MapCoast Partnership has adopted a number of imaging tools to rapidly and efficiently map the benthos. One of these tools, the sediment profile imagery (SPI) camera, records images at the sediment-water interface and up to 20 cm below, where most benthic activity takes place. In Ninigret Pond, a coastal lagoon on the south shore of Rhode Island, this methodology was used to identify and quantify the types of infauna, epifauna, and vegetation present in the environment, and determine the depth to which the sediment in oxygenated. To fully characterize the benthos, SPI was used along with underwater video, plan-view still photographs, and grab samples. In addition to providing basic habitat information, sediment profile images have a set of indices developed to assess ecosystem health. The Benthic Habitat Quality (BHQ) index scores images based on the depth of the apparent Redox Potential Discontinuity (aRPD), the number of infauna and epifauna present, and the presence of evidence of biological activity, such as burrows, fecal casts, and feeding pits. In Greenwich Bay, a shallow eutrophied bay within Narragansett Bay, Rhode Island, SPI images were analyzed for BHQ at twenty-two stations once a month from June through October 2006. The BHQ was used to track benthic condition and presence of hypoxic water throughout the summer in this bay, which frequently experiences low dissolved oxygen events and occasional fish kills.

Land Use Planning

P40. USING ARCGIS TO DEFINE WATERSHEDS AROUND SIX BRACKISH DETENTION PONDS LOCATED IN COASTAL SOUTH CAROLINA
Larissa Brock, South Carolina Algal Ecology Laboratory; South Carolina Department of Natural Resources
David L. White, NOAA's Hollings Marine Laboratory
Heath Kelsey, JHT Incorporated at NOAA CCEHBR
Alan J. Lewitus, South Carolina Dept. of Natural Resources, Marine Resources Research Institute
Susan B. Wilde, Belle Baruch Institute for Marine Biology and Coastal Research

In coastal South Carolina, developers most commonly use stormwater detention ponds as a best management practice to mitigate non-point source pollution. As the developed coastline expands, so do the number of detention ponds. Due to the design and function of coastal detention ponds in South Carolina there have been an increased incidence of harmful algal blooms in these systems. In order to adequately study the ecology and hydrology of the detention ponds it is necessary to understand how developed landscapes affect the water quality. Presented here is a methodology that allows watershed delineation of sub-watersheds for stormwater detention ponds using ESRI ArcGIS 9.0. Results are presented detailing watershed delineation, land use classification, and statistical analysis of relationships between the land use categories and pond water quality. Research initiative is directly applied to water quality mitigation by the Kiawah Island Community Association Lakes Management Department.

P41. LAND USE MAPPING: SEMI AUTOMATED METHODS FOR COMPILING AND UPDATING LAND USE/LAND COVER MAPS
Sudha Maheshwari, Andrew Brenner, and Edward Luthy, Sanborn

Many communities, counties, and states have invested heavily in land use and land cover datasets to serve their need for managing land resources and growth. Most of these products were hand digitized based on manual photo interpretation. This process is time-consuming, expensive, and inconsistent. Therefore, many land use datasets are now dated and badly in need of updates. Sanborn has developed a semi-automated methodology to update land use/land cover maps that is cost-effective, timely, and based on automated image interpretation, and hence consistent. This presentation will discuss this methodology and results of the delineation of land use and land cover for various projects.

P43. THE EXPERTS VERSUS THE ALGORITHM: A COMPARISON OF MARINE PROTECTED AREAS ALONG CALIFORNIA'S CENTRAL COAST IDENTIFIED BY STAKEHOLDERS AND CONSERVATION PLANNING TOOLS.
Carissa Klein, University of Queensland

California's Marine Life Protection Act directs the state's Department of Fish and Game (CDFG) to establish and manage a state-wide network of marine protected areas (MPAs). In 2005, the CDFG began a stakeholder-driven process to design a network of MPAs along the Central Coast of California that meet biodiversity goals and minimize socioeconomic impact. A group representing affected members of the study region was formed and charged with proposing alternative networks of MPAs. With advice from a Science Advisory Team (SAT), the stakeholder group developed three alternative networks of MPAs along the Central Coast. Guided by the proposed networks, CDFG Commission established a network of MPAs to be implemented along the Central Coast. We used systematic conservation planning tools MARXAN and MarZone (developed by Hugh Possingham et al.) to identify networks of MPAs that meet the biophysical goals of the SAT, while minimizing potential impact on commercial and recreational fishing industries. We compare the most efficient networks identified by MARXAN and MarZone with the networks proposed by the stakeholders and show how the biodiversity value and socioeconomic cost of the solutions differ. In addition, we used the tools to identify areas with the highest irreplaceability and compare these with the networks proposed by the stakeholders. The efficiency of utilizing these conservation planning tools is demonstrated in this analysis. We demonstrate the utility of incorporating systematic conservation planning tools with the expert-based approach to designing protected areas.

P44. CONSERVATION PLANNING USING LATIS, A SCALABLE SPATIAL DECISION SUPPORT SYSTEM FOR ASSESSING THE IMPACTS OF PLANNING DECISIONS
Tim Schauwecker and Mary Love Tagert, Mississippi State University

Reducing non-point source pollution associated with agricultural production is a high priority for policy makers and researchers. Tools developed to aid landowners and stakeholders in making sound decisions are being developed and need to be field tested. The test case of an 880-acre dairy farm was used to compare hydrologic modeling outcomes using FarmLatis, a scalable spatial decision support system, to evaluate before- and after-installation effects of Best Management Practices (BMPs). FarmLatis is being developed to aid in the process of placing BMPs in the landscape in the most beneficial and cost-effective means possible. The test site is the Mississippi Agricultural and Forestry Experiment Station Dairy Unit, an 880-acre facility consisting of a dairy production facility, pasture, row crop and riparian forest in northeast Mississippi. The Latis framework is a Geographic Information System combining BMP cost and efficiency information with the HSPF hydrologic modeling tool. The Conservation Planning process will be improved through the use of these tools, which allow multiple scenarios to be tested for their efficacy before final decisions are made as to land management practice.

P45. GEOSPATIAL TECHNOLOGIES FOR ASSESSING WATER QUALITY IMPACTS OF FAILING SEPTIC SYSTEMS IN A COASTAL AREA
Mary Love Tagert, Jonathan Pote, and James Martin, Mississippi State University
Quinton White, Jacksonville University

A study has recently been initiated to determine the water quality impacts of failing onsite wastewater systems (OWS) on the St. John's River and its tributaries near Jacksonville, Florida. The four main objectives of the study are as follows: 1) review previous Total Maximum Daily Load (TMDL) studies and other studies related to failing OWS that have been performed in the study area, 2) compile and review data on permits issued for OWS, 3) incorporate geospatial technologies to help develop a water quality sampling plan and analyze potential trends, and 4) implement an intensive sampling plan to analyze samples at 3 baseline sites and approximately 22 potentially impacted sites for total Kieldahl nitrogen (TKN) and phosphorous. Field measurements for temperature, salinity, and dissolved oxygen are also being taken at each site. Efforts are being made to capture both dry and wet weather samples monthly at each site from September 2006 through February 2007, or the duration of the project. Sample collection and analysis has begun, and geospatial and sampling data will be collected and evaluated as data becomes available throughout the initial six-month project. An analysis of the data will determine if the project should be extended for an additional six months or more.

P46. A SUITABILITY MODEL TO GUIDE THE SELECTION OF WETLAND MITIGATION SITES
Kristal Walsh and Johan Liebens, University of West Florida

The effects of wetland loss on regional ecosystems are well documented, but many areas continue to manage wetland mitigation with in-kind, on-site practices. The goal of this research was to demonstrate the use of a GIS spatial data model as a prescreening tool for selecting wetland mitigation sites at the watershed scale. This study used topography, hydrology, soils, and landcover information as data layers to characterize site conditions for three coastal plain watersheds in Northwest Florida. Similar studies have been done where there is greater topographic relief but flat areas present different challenges in watershed modeling. A combination of tools from ArcHydro and TauDEM were used to accurately depict topographic and hydrologic features from 30m DEMs. This data layer provided the basis for additional

calculations including slope, flow direction, and contributing drainage area (CDA). Based on other multi-criteria wetland assessments performed in a GIS, each data layer was assigned a value, representing its weight of influence on wetland location. Environmental criteria about each layer are given scores indicating less or more favorable site conditions. These criteria include a wetness index based on flow accumulation and slope, nearness to stream, hydric soils, critical distance to adjacent landuse, landuse/landcover, and presence of relict wetlands. A geometric mean of the weights of the data layers and their criterion scores was calculated to produce a suitability map of potential locations. Model accuracy was evaluated by performing field-surveys for vertical topographic error and CDA, measuring hydraulic conductivity for soil saturation potential, and visual inspection of landuse/landcover.

P47. USE OF GEOSPATIAL TOOLS TO SUPPORT A REGIONAL SEDIMENT AND WATER CLARITY STRATEGY FOR THE CHESAPEAKE BAY

John Wolf, National Park Service, Chesapeake Bay Program Office
Howard Weinberg, University of Maryland
Keely Clifford, U.S. Environmental Protection Agency

Chesapeake Bay water quality criteria were designed to protect the ecological integrity of the tidal waters of the Bay. However, to ensure that the criteria are being attained there must be adequate means to measure and evaluate water quality relative to the criteria levels. Geographic information systems (GIS) are being used to support the water quality criteria assessment, and are now being used to identify sediment and water clarity problem areas in the Bay and its tidal tributaries (e.g. – priority areas for TMDL's). The resulting analyses will be used to provide spatial delineation of regions for the development of sediment management initiatives and the attainment of designated uses based on water clarity criteria. This poster describes the current use of geospatial technologies in the identification of "sedimentsheds" and areas not attaining water clarity suitable for growth of submerged aquatic vegetation. (A sedimentshed is defined as an area, including upland, nearshore, and sub-aqueous, that contributes the sediment loads that directly influence water clarity in specific shallow water habitats.) A fixed and cruise-based dataflow tidal water monitoring network has been leveraged to evaluate sediment and clarity issues at multiple spatial and temporal scales. The resulting monitoring data has been used in grid-based interpolations to provide the spatial framework for identifying problem areas. The corresponding interpolations are being summarized and analyzed based on an established Chesapeake Bay segmentation scheme, which is the geographic framework for State water quality designated use regulations.

Remote Sensing

P48. AUTOMATING FEATURE EXTRACTION FROM GEOSPATIAL IMAGING IN THE COASTAL ZONE

Paul Bissett, Florida Environmental Research Institute
Seth Blitch, Florida Department of Environmental Protection
Mark A. Moline, California Polytechnic State University
Richard C. Zimmerman, University of Oregon

The coastal zone presents a unique problem in automating feature extraction using film and digital imaging systems. The water and vegetation features are usually very dark compared to bright terrestrial and urban features, and this darkness can make it difficult to develop robust methods to extract features from the image without a large amount of personnel time. The difficulties stem mainly from (1) the lower signal to noise that accompanies dark targets measurements, (2) the limited spectral resolution of current film and digital imagery, and (3) the increased errors associated with the correction of atmospheric and solar illumination

variations within, and between, the images. In addition, the lack of easily recognized ground control points makes ortho-rectification difficult, which limits the ability to use spectral ground control information to help process the imagery. The solution to these difficulties requires a unique approach to sensor design, as well as calibration and processing techniques, in order to demonstrate robust feature extraction for geospatial information products. The creation of automated feature extraction in these environments will increased workflow efficiency in the production of coastal geospatial information products, and when fused with other sensor data products, e.g., LIDAR, has the potential to create a total geospatial imaging solution for many current survey and mapping applications. This presentation discusses our solutions for coastal environments, including examples of fused sensor products from both California and Florida coastal environments.

P49. IFSAR DATA ACQUISITION FOR HAWAI`I COASTAL MANAGEMENT

Darcee Killpack and Christine Loftus, NOAA's Pacific Services Center

Interferometric Synthetic Aperture Radar (IfSAR) high-resolution elevation data were collected in late 2005 for the main eight islands of Hawai`i: Kaua`i, Ni`ihau, O`ahu, Moloka`i, Lana`i, Maui, Kaho`olawe, and the island of Hawai`i. These data are useful in a variety of coastal applications, such as wetland restoration and preservation, flood risk assessment, emergency response, and land cover analysis. Data sets available to the public include digital terrain models and digital surface models. This imagery, which has a 5-meter horizontal posting and a 2-meter vertical accuracy, will facilitate robust coastal science applications, helping coastal managers make more informed regional decisions.

P50. IMPROVING THE HARMFUL ALGAL BLOOM FORECAST SYSTEM WITH OPTICAL DATA FROM AUTONOMOUS UNDERWATER VEHICLES

Rebecca Love, I.M. Systems Group at the NOAA Coastal Services Center
Mary Culver, NOAA Coastal Services Center
Gary Kirkpatrick, Mote Marine Laboratory
Bob Currier and Jim Hillier, Mote Marine Laboratory
Richard P. Stumpf and Michelle Tomlinson, NOAA National Centers for Coastal Ocean Science

Each year the Gulf of Mexico experiences harmful algal blooms (HABs) caused by the dinoflagellate *Karenia brevis*. These HABs are responsible for human health impacts, shellfish bed closures, dolphin and manatee deaths, and fish kills. A National Ocean Service funded partnership project is improving the prediction of HABs by integrating advanced technologies and data sources such as respiratory and hydrodynamic model output and autonomous underwater vehicle (AUV) gliders. AUV gliders are becoming increasingly important observation platforms for investigating HAB initiation sites because of their unique capability for adaptive sampling. The AUVs are equipped with an optical instrument called a BreveBuster. Developed by Mote Marine Laboratory, the BreveBuster is capable of identifying *K. brevis* blooms by their absorbance signal and provides a Similarity Index (SI) value which represents the fraction of *K. brevis* biomass in the phytoplankton community. The AUV gliders are programmed to sample a transect and can be readily redirected. Data from the AUV gliders are sent via satellite back to a computer in near real time and are posted to the web. Analysts with the Harmful Algal Bloom Forecast System, a collaborative effort among state and local managers, research scientists, and various offices within the National Oceanic and Atmospheric Administration, will use this data to locate blooms not detected by surface sampling or satellite imagery. Various options are being considered for displaying this three-dimensional data within a system that integrates satellite imagery, field observations, and model output to produce an operational bulletin twice weekly for coastal managers.

Tools for Ecosystem-Based Management

P51. LANDSCAPE CHARACTERIZATION FOR A WATERSHED APPROACH TO COASTAL ECOSYSTEM MANAGEMENT

John Cartwright and David Shaw, GeoResources Institute, Mississippi State University

The GeoResources Institute of Mississippi State University established a dedicated research agenda for the integration of watershed science/modeling and coastal ecosystem management as part of NOAA's Northern Gulf of Mexico Cooperative Institute. Research and application development efforts are focused on the use of geospatial technologies and high performance computing for the improvement of watershed modeling capabilities towards the enhancement of coastal ecosystem management and prediction of surface water quality in coastal hydrologic systems. Initial tasks of first year research efforts include, but are not limited to, basin selection within the northern Gulf of Mexico, basin scale priorities, geospatial data acquisition and inventory, hydrologic network development, upland landscape characterization, and preliminary linkages of landscape characteristics to ecosystem health. The initial area of research reaches from the eastern shore of Mobile bay in Alabama to the Pearl River in Mississippi, including such areas as the Weeks Bay National Estuarine Research Reserve (WKBNERR), the Dog River watershed, the Grand Bay National Estuarine Research Reserve (GBNERR), and Bay St. Louis watershed. The identified basins within this study area each represent various levels of upland landscape alterations and development ranging from highly pristine or natural, agricultural domination, highly developed, and an eclectic mixture of each. Initial basin landscape characterizations include land-use/land-cover percentages and change, terrain and geomorphologic analysis, hydrologic classifications, and spatial relationships of landscape complexes. These characterizations will be used to generate a template for upland watersheds and coastal ecosystems associations for the improvement of watershed modeling parameters and estimations of surface water quality.

P52. MAPCOAST PARTNERSHIP: USING SHALLOW COASTAL ECOSYSTEM SOIL AND SEDIMENT MAPPING DATA TO IMPROVE COASTAL ZONE MANAGEMENT

Janet Freedman and James Boyd, Rhode Island Coastal Resources Management Council

As the policy and regulatory agency for Rhode Island's coastal zone, the Coastal Resources Management Council (CRMC) has particular interest in a standardized soil/habitat mapping protocol to improve coastal ecosystem management decisions. Using more detailed soil and sediment data, bathymetry, sonar, and side scan imagery developed through the MapCoast Partnership, the CRMC will be more effective in assessing suitable habitat restoration sites for coastal wetlands, Eelgrass, and shellfish. These more detailed data sets can also provide valuable information for the assessment of dredging needs and management of dredged materials in the coastal environment. The mapping and characterization of benthic habitat will permit much better assessment of ecological conditions and allow coastal managers to evaluate the success (or failure) of habitat restoration efforts and permit-required pollution abatement controls. Additionally, the integration of the MapCoast Partnership data will enhance the effectiveness of the CRMC Special Area Management Plans (SAMP) by linking important subaqueous soil and benthic habitat data with development and implementation of floodplain, hazard mitigation, habitat protection and restoration, and coastal buffer management tools.

P53. USING GIS TO TRACK POTENTIAL ECONOMIC GAINS AND LOSSES IN ZOSTERA MARINA BEDS

Zachary Hughs, Sandy Wyllie-Echeverria, and Kevin Britton-Simmons, University of Washington
Gary Greene, California State University, Moss Landing Marine Labs
Kathy Boyer, San Francisco State University
Pete Dowty and Blain Reeves, Washington Department of Natural Resources
Ted Smith, Washington State Parks

Using examples from the San Juan Archipelago, northwest Washington State and San Francisco Bay, we demonstrate the value of using Geographic Information Systems (GIS) to estimate economic loss and/or gain associated with Zostera marina resources. Data input includes information from multibeam bathymetry, backscatter, underwater video transects and aerial photography. GIS then allows us to calculate the amount of acreage either lost or potentially gained. With these data and an ecological services valuation, we can then estimate the production value and capital value of seagrass beds and the resultant loss or gain. We describe this process and discuss the importance of these tools to evaluate the success of conservation efforts and restoration programs. These methods can be used by resource managers and researchers when considering economic and ecological services impact of habitat loss, conservation, and restoration efforts.

P54. ALTERNATIVE METHODS TO SPATIALLY DISTRIBUTE FISHING EFFORT WITHIN THE HAWAIIAN LONGLINE FISHERY AND CORRESPONDING EFFECTS ON THE CALCULATION OF BYCATCH RATES

Connie Kot and Daniel C. Dunn, Duke University Marine Lab

Bycatch in longline fisheries has been recognized as a threat to many endangered populations of sea turtles, sea birds, and marine mammals. The health of endangered species populations, combined with the economic and social importance of the fisheries, have led to studies that investigate the spatial distribution of longline fisheries effort to understand catch and bycatch rates. These analyses generally ascribe effort from an individual set to the point at which the gear is deployed or hauled. Typically, reported fishing effort summarizes these values over large areas (>1°). Although the set or haul locations may be sufficient for large-scale summaries of general fishing effort, finer-resolution models, such as those associating local oceanographic effects to catch or bycatch rates, may be strongly influenced by the method used to spatially allocate fishing effort. As part of a larger Duke University and Blue Ocean Institute bycatch assessment project (Project GLOBAL), we look at alternative methods (i.e., centroids, polylines, and polygons) for distributing fishing effort of the Hawaiian longline fleet. This assessment helps to determine the appropriate method for distributing fishing effort based on the resolution of the model.

P55. ZONING DESIGN FOR MARINE PROTECTED AREAS USING MULTI-CRITERIA ANALYSIS, GIS AND STAKEHOLDER PREFERENCES: THE RED SEA MARINE PEACE PARK CASE

Michelle Portman, University of Massachusetts, Boston

Zoning schemes define spatial objectives in a format understandable to those who are on-going users of area resources. For marine protection, zoning schemes can help balance multiple resource uses especially where ecosystems cross political boundaries. Literature on ocean zoning points out the need for analytical tools that guarantee stakeholder involvement and that

address the unique spatial characteristics of sea. I illustrate the use of multi-criteria analysis to address the spatial character of marine and coastal environments, including some landside activities, and the “public” character of marine resources. The analysis combines qualitative and quantitative data of the landside and ocean environment with stakeholder preferences to identify areas most suitable for varying levels of protective zoning. To solicit preferences, social science survey techniques are used at an early stage in the process. I administer a pair-wise comparison survey to stakeholders in two countries and conduct the spatial multi-criteria analysis using a geographical information system. This comprehensive approach addresses the challenges of designing zoning for a cross-border, multi-jurisdictional marine protected area where there are varying levels of information between countries, limited cooperation between managers and scientists, differing statutory regimes, and difficulties bringing stakeholders together to solicit their opinions. The selection of criteria that adequately reflects physical attributes and the inclusion of many and varied stakeholders are crucial for use of the model. As a case study, I developed a zoning proposal for the Red Sea Marine Peace Park, jointly managed by Jordan and Israel in the northern Gulf of Aqaba.

P56. ASSESSMENT OF GEOGRAPHIC EXTENT OF PROJECTS ENCOMPASSED BY THE NOAA NORTHERN GULF INSTITUTE USING GEOGRAPHIC INFORMATION SYSTEMS

Joby Prince, David Shaw, Sharon Hodge, and Charles Hill, Mississippi State University

The Northern Gulf Institute (NGI) manages large-scale ecosystem level data on all features which impact ecosystems in the northern Gulf of Mexico. The geographic extent of research projects covered by the NGI needs to be quantified to address research gaps. This is also important because it reduces redundancy in research and data acquisition, while increasing opportunities for inter-agency/inter-state collaboration. The use of geographic information systems provides a significant tool in this endeavor. Geospatial technologies are the foundation of the NGI design. Every aspect of the Institute is being created around the use of these technologies. As thus, this assessment directly ties into the NGI’s mission and framework. This is also beneficial as the management of research efforts across the whole region will ensure standardization of data formats and compliance with metadata reporting. Given the popularity of ecosystem-based management it is imperative that current and future research funded through the NGI focus on regional ecosystem impacts as well as local impacts. It is also important that ecosystems be framed as part of a larger network, interconnected with the global ecosystem. The NGI design ensures that an ecosystem-based management approach is accomplished. Associated with the NGI is the development of an Ecosystem Data Assembly Center (EDAC). The EDAC creates research opportunities in accordance with the NOAA’s strategic plan and the NGI directives. As proposals are evaluated, it will be invaluable to view their contributions geographically as well as scientifically.

P58. HABITAT SUITABILITY MODELING OF PINK SHRIMP ON THE WEST FLORIDA SHELF

Peter Rubec and Jesse Lewis, Florida Fish and Wildlife Conservation Commission
Robert Weisberg, College of Marine Science, University of Florida
Chris Jenkins, University of Colorado at Boulder

A study was conducted to model and map the spatial distributions and abundances of pink shrimp (*Farfantepenaeus duorarum*) on the West Florida Shelf (WFS) using habitat suitability modeling (HSM). Data loggers and an electronic logbook system installed on three shrimp boats were used to gather data concerning catch (lbs) and effort (hours fished) for pink shrimp along with associated bottom temperature, salinity, and depth data at known coordinates during fishing operations. Data provided by the fishing company collected using a vessel monitoring system allowed the creation of a map depicting areas with high fishing effort. Significantly higher mean catch rates (CPUEs) of pink shrimp occurred on the WFS during June to September, and October to December 2004 in comparison to January to March, and April to June 2005. Oceanographic modeling predicted monthly averaged bottom currents (speed and direction) and temperatures for a 16-month period from March 2004 to June 2005. Current speed and direction data indicated marked upwelling onto the WFS during 2004, and downwelling from the shelf during 2005. Sediment data from the WFS were interpolated to produce a sediment distribution map. Suitability functions were created across environmental gradients to predict CPUEs in relation to depth, aspect, bottom type, bottom temperature, current speed, current direction, and VMS zones. The HSM linked to geographic information systems were used to predict spatial distributions and abundances of pink shrimp monthly from March 2004 to June 2005. The areas with the most pronounced upwelling were also the areas that the HSM analyses predicted should have the highest catch rates. This was verified by overlaying observed CPUEs from the fishing vessels onto the suitability zones predicted by the HSM. Nutrients carried onto the shelf promoted higher shrimp abundances. The analyses estimated mean CPUEs by HSM zones. Linking fisheries to oceanography can explain how the ecosystem functions to the benefit of both the fishing industry and fisheries management.

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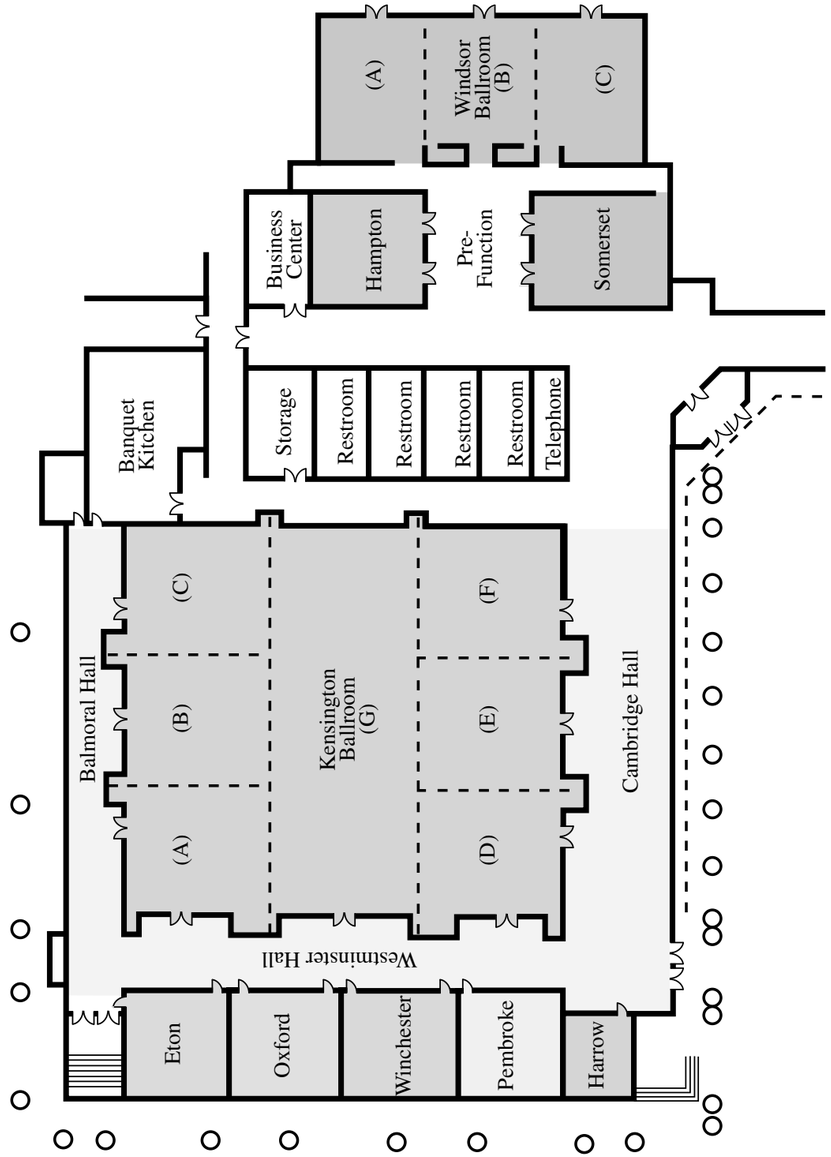
Embassy Suites Conference Center Floor Plan



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