March 7 to 10, 2005

Coastal GeoTools '05

Kingston Plantation

Myrtle Beach, South Carolina

Conference Goal

This conference was developed to further the understanding and applied uses of geospatial data and tools for effective coastal resource management.

Conference Objectives

- Promote the application of geospatial tools, methods, and training needed for coastal management.
- Explore critical geospatial technology and training issues.
- Promote sharing of standards and coastal data through the National Spatial Data Infrastructure (NSDI).
- Enhance networks for developing public and private partnerships.

A Message from the Director of the NOAA Coastal Services Center

Dear Colleagues,

Welcome to Coastal GeoTools '05! The fourth biennial edition of this exciting conference focuses on real-life coastal applications of geographic information systems (GIS), remote sensing, and decision-support tools, as well as the development of the National Spatial Data Infrastructure.

While attending this year's conference, you will have the opportunity to be with people who understand not just what you do, but why you feel driven to do it. Immerse yourself in the technology topic or application of your choice, and listen, discuss, and see what has worked for others. We hope you will find old friends and maybe make some new ones.

Be prepared to take your pressing technical challenges to the Technology Doctor's Office, as well as get the perspectives of leaders like Dr. Michael Goodchild, professor of geography at the University of California, Santa Barbara, and director of the National Center for Geographic Information and Analysis, and Dr. Rick Spinrad, assistant administrator for the National Ocean Service.

When Coastal GeoTools '05 concludes, you will have creative solutions to coastal management problems that you can take back to your workplace. Your technology skills will be honed from attending special interest meetings and trainings, and learning the latest techniques from your peers. You will take with you new business contacts and partnerships.

When not learning about cutting-edge technologies and networking, GeoTools conference attendees can take advantage of all that the South Carolina coastline has to offer, including an abundance of golfing and shopping, beautiful beaches, and a variety of other natural resources. The social highlight of the week will be the private "Lowcountry Beach Bash" in the Palmettos Pavilion at Kingston Plantation, where we will treat you to true Southern hospitality.

This is your conference. We hope you will take advantage of all the opportunities available for coastal resource management professionals to share their rapidly expanding technical knowledge and experiences, and to participate in the coastal management technical evolution.

We are glad you are here! Now go learn, share, and have fun.

Margaret A. Davidson

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GeoTools '05 Conference Exhibitors

3001
Digital Globe, Inc.
EarthData
Earth Satellite Corporation
ESRI
Federal Geographic Data Committee
Fugro Pelagos
GIS Solutions, Inc.
I. M. Systems Group
IVS 3D – Fledermaus
Leica Geosystems GIS & Mapping, LLC
Perot Systems Government Services, Inc.
Photo Science, Inc.
Pro EMPT
Red Hen Systems, Inc.
Sanborn
Space Imaging
Western Air Maps, Inc.
Woolpert, Inc.

Principal Sponsor

NOAA Coastal Services Center

External Committee

Ron Birk	NASA Office of Earth Science
Hank Burch	Alabama Department of Conservation and Natural Resources
Bill Burgess	BurGIS consulting
Dave Carter	Delaware Coastal Programs
Chris Chung	Hawaii Coastal Zone Management Program
Lee Dantzler	Ocean.U.S. Data Management and Communications
Ivan DeLoatch	US Geological Survey
Claire Drury	Federal Emergency Management Agency
Scot Friedman	Texas General Land Office Coastal Division
Tanya Haddad	Oregon Coastal Management Program
Dave Hart	University of Wisconsin
Debra Hernandez	South Carolina Office of Ocean and Coastal Resource Management
Mary Pope Hutson	Land Trust Alliance
Roger Johnson	National Park Service
William Johnson	National States Geographic Information Council
Sarah Johnston	Alabama Department of Conservation and Natural Resources
Debbie Keller	Northwest Florida Greenways Project, The Nature Conservancy
Jeff Lillycrop	US Army Corps of Engineers, Mobile District
Dave Mackey	Ohio Office of Coastal Management
Larry Mayer	University of New Hampshire, Joint Hydrographic Center
John Palatiello	Management Association for Private Photogrammetric Surveyors
Mark Reichardt	Outreach and Adoption Program, OpenGIS Consortium
Tina Shumate	Mississippi Department of Marine Resources
Paul Veisze	California Department of Fish and Game
Dawn Wright	Oregon State University

Conference Overview

Monday, March 7

Training Sessions – 8:30 to 11:30 a.m. (*See descriptions on page 6.*)
Coastal Applications of Tides and Vertical Datums: Kensington A
Introduction to Remote Sensing: Kensington B
Metadata – The Next Step: Kensington C

Special Interest Meetings – 1:00 to 4:30 p.m. (*See descriptions on page 7.*)
Comprehensive Hurricane Preparedness Study – GIS Tools and Applications: Kensington A
FGDC Marine and Coastal Spatial Data Subcommittee: Kensington B
Remote Sensing of Coastal Water Quality: Kensington C

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

Tuesday, March 8

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

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

NOAA Welcome
Margaret A. Davidson, Director, NOAA Coastal Services Center, Charleston, South Carolina

Keynote Address
Dr. Michael Goodchild, Professor of Geography at the University of California, Santa Barbara, and Director of the National Center for Geographic Information and Analysis (NCGIA)

Break – 10:00 to 10:30 a.m.

Morning Sessions – 10:30 a.m. to 12:00 p.m. *See abstracts on page 9.*

Remote Sensing Applications: High Resolution Data Kensington A	Coastal Mapping and Shoreline Change: Shoreline Stabilization Kensington B	Hazards: Vulnerability Assessment Kensington C	Land Use and Community Planning: Coastal Conservation Kensington D
A01. The Use of High Resolution Imagery in Creating an Accurate Shellfish Map and Its Application Toward Improving Shellfish Habitat	A04. Reef Balls for Shoreline Stabilization at MacDill AFB	A07. A Tropical Weather Vulnerability Assessment for Texas Coastal Counties	A10. Filling Data Needs for Coastal Conservation Panel Discussion
A02. Next Generation Landcover Mapping: The Face of the Future	A05. Rates and Processes of Shoreline Change at Fort Pulaski National Monument, GA: a GIS-Based Assessment	A08. GIS-Based Automated Vulnerability Assessment Tools for the Coastal Risk Atlas	
A03. Detection of Wetland Vegetation and Vegetation Change Using High Resolution Hyperspectral Remote Sensing	A06. Assessment of Shoreline Stabilization Using Digital Orthophotography, Global Positioning Systems and GIS	A09. Development of a Comprehensive GIS Parcel Database for the Coastal Hazard Zone of Lake Ontario	

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

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

See abstracts on page 14.

Benthic Mapping: Techniques I Kensington A	Coastal Mapping and Shoreline Change: Shoreline Databases Kensington B	Coastal Hazards Kensington C	Data Sharing I Kensington D
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B02. Benthic Habitat Mapping in Tropical Marine Environments Using QuickBird Multispectral Data	B05. NOAA'S Pacific Islands Assistantship Program at Work on Guam: Building Local Spatial Technology Capacity and Providing Support for Coastal Mapping Projects	B08. Wisconsin Shores: DVD For Coastal Hazards Education in Wisconsin	B11. Interaction Between Coastal Sediment Databases
B03. Mapping Pacific Island Coral Reef Ecosystems with Multibeam and Optical Surveys	B06. Shoreline Change in the Saipan Lagoon	B09. New Parameterization Scheme for Wind Input and Surface Roughness for Spectral Wave Models – With Particular Emphasis to Hurricanes and Tropical Storms	B12. Spatial Analysis of Fisheries Data in Chesapeake Bay: Making Sense of the Data and Tools to Analyze It

Break – 3:00 to 3:30 p.m.

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

See abstracts on page 20.

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C02. Delaware Bay Benthic Mapping Project	C05. Evaluating the Digital Shoreline Analysis System (DSAS) for Virginia Shoreline Classification	C08. New Tools for Visualizing Coastal Hazards on the Great Lakes	C11. Withdrawn
C03. Marine Application of Acoustic Base Maps and Realtime GIS in Shallow Water Environments	C06. The Coastal Geotoolbox: Making Coastal Geomorphology Data More Accessible	C09. Visualization and Knowledge Transfer for Gull Lake Erosion Modeling Using ArcPublisher and ArcReader	C12. Terrain Modeling for Developing Hydrologic Response Units for Undulating Landscapes

Wednesday, March 9

Early Morning Sessions – 8:30 to 10:00 a.m.

See abstracts on page 27.

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D02. Change in Nearshore Substrates Along the Central and Western Basin Shore of Lake Erie	D05. Leica ADS40 Sensor for Coastal Multispectral Imaging	D08. ECOGIS – GIS Tools Supporting Ecosystem Approaches to Management	D11. The Nonpoint-Source Pollution and Erosion Comparison Tool
D03. Using Landsat Imagery for Coastal Monitoring and Management	D06. Mapping Shoreline Attributes In Puget Sound: A Comparison of Remote Sensing Platforms	D09. Developing a Dynamic and Distributed GIS to Support Coastal Management Along the Lake Superior Coast of Wisconsin	D12. Developing a Watershed Nutrient Management Tool for Evaluating Agricultural BMPS for Reducing Nutrient Loading in Coastal Watersheds

Break – 10:00 to 10:30 a.m.

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

See abstracts on page 34.

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E02. Using Winslow's 1886 Pamlico Sound Oyster Bed Survey and GIS to Guide Future Restoration Projects	E05. The Coastal Change Analysis Program (C-CAP): The Past, Present, and Future of Land Cover Mapping in the Coastal Zone	E08. GIS and Mobility Support for New Jersey Watershed Volunteer Monitoring Network	E11. Development of a Spatial Analysis Tool to Assess Vessel Speed Zones to Protect Cetaceans
E03. Mapping Predicted Tidal Exposure Durations Using A LIDAR Based MLLW-Referenced Terrain Model for Invasive *Spartina alterniflora* Treatment and Control in Willapa Bay	E06. High Resolution Coastal Land Cover for Local Resource Management	E09. Seabird Ecological Assessment Network Mapping Application (SEANET MAP): Data Distribution and Internet Mapping for Marine Ecosystem Health	E12. Analysis of Spatial and Socioeconomic Baseline Information and Fishing Profiles in Support of the Joint Management Plan Review (JMPR) Process: An Application of the Ocean Communities 3E Analysis (OCEAN) Tools

Plenary Lunch, Kensington Ballroom – 12:00 to 2:30 p.m.
Richard Spinrad, Ph.D., Assistant Administrator, NOAA National Ocean Service

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

See abstracts on page 40.

Remote Sensing Applications: Coasts and Oceans Kensington A	Ocean Observing Systems for Coastal Managers Kensington B	Habitat Restoration: Remediation and Landscapes Kensington C	Information Technology for Managers Kensington C
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F02. Integrated Airborne Bathymetric LIDAR and Multibeam Echosounder Coastal Zone Mapping in Alaska and California	F05. Spatial Analysis of Chesapeake Bay Water Quality Data	F09. A Web-Based GIS Oil Spill Portal	F12. A Comprehensive Overview of Interferometric Synthetic Aperture Radar (IFSAR) for Coastal Management Organizations
F03. Remotely Sensed Precipitation Data and Digital Forecasting Products for Fecal Coliform Modeling in Shellfish Harvest Areas	F06. Remote Sensing Contributions to the Southeast Atlantic Coastal Ocean Observing System (SEACOOS)	F10. Coastal Habitat Assessment and Planning Tool: Lake St. Clair Pilot Study and Potential National Application	F13. Building Geospatial Capacity for Water Management Agencies in the Upper Pearl River Basin
	F07. Developing a Framework for Distributed and Dynamic Data Sharing Among the Coastal Ocean Community: Gulf of Maine Spatial Data Project and the Open IOOS Portal		

National States Geographic Information Council Discussion Session, Eton – 2:30 to 4:00 p.m.

Reception in Palmetto Pavilion – 7:00 to 10:00 p.m.

Thursday, March 10

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

See abstracts on page 49.

Benthic Mapping: Habitat Models Kensington A	Coastal Mapping and Shoreline Change: Survey Methods Kensington B	Ocean Observing Systems: Data and Management Kensington C	Land Use and Community Planning: Impacts to Resources Kensington D
G01. Seagrass Habitat Prediction and Level of Protection in the Caribbean	G04. LIDAR Surveys, Total Station Surveys, and Aerial Photography for Dune/ Beach Template Design at Fire Island National Seashore	G07. Locate the Mean High Water Line – Why Put Off Until Tomorrow What You Can Do Today?	G10. Working with Developers to Evaluate and Reduce Bacteria and Nutrient Loading in the South Carolina Lowcountry
G02. Linking Benthic Complexity, Hardbottom and Fish Aggregations in Marine Protected Areas Proposed by the South Atlantic Fishery Management Council	G05. Modern Techniques for Improved Topo/Bathy Elevation Modeling: Part 1 – Data Acquisition	G08. COASTMAP: an ARCGIS Extension for Integrating Temporal Metocean Data	G11. Urban Development Along the Shoreline of the Chesapeake Bay and Its Tidal Tributaries
	G06. Modern Techniques for Improved Topo/Bathy Elevation Modeling: Part 2 – Surface Modeling and Analysis	G09. Near Real-Time Ocean Observations Online: Data Management Within the Southeast Atlantic Coastal Ocean Observation System (SEACOOS)	G12. the Baldwin County Wetland Conservation Plan

Break – 10:30 to 11:00 a.m.

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

See abstracts on page 55.

Remote Sensing Applications: Mapping with LIDAR Kensington A	Fisheries and Protected Species Management Kensington B	Benthic Mapping: Marsh, Kelp, and SAV Kensington C	Land Use and Community Planning: Visualization Techniques Kensington D
H01. Improved Coastal Mapping through Sensor Fusion	H04. Beyond Mapping: Building Analytical Tools for Assessing West Coast Groundfish Essential Fish Habitat (EFH) Using GIS and Bayesian Network Models	H07. Mapping the Distribution of Submerged Aquatic Vegetation and Saltmarsh in the Padilla Bay NERR, 2004	H10. Finger Lakes Decision Support System Project
H02. Digital Elevation Data in Maryland: From Acquisition to Use by Coastal Communities	H05. Using GIS as a Tool in Assessing Habitat Usage of Gray Whales, *Eschrichtius robustus*, in the Coastal Waters of British Columbia	H08. Historical Kelp Surveys in California	H11. ARCIMS for Land Use Planning in American Samoa
H03. Using Airborne LIDAR Bathymetry to Map Shallow River Environments	H06. Building an Integrated Data Entry and Mapping System for the Northeast Cod Tagging Program Using ARCIMS and ARCSDE	H09. a Multi-Scale Segmentation Approach to Mapping Seagrass Habitats	H12. Social Weather Maps

Conference Adjourns – 12:30 p.m.

Conference Abstracts and Detailed Agenda

Monday, March 7, 2005

TRAINING SESSIONS
8:30 to 11:30 a.m.

Training: Coastal Applications of Tides and Vertical Datums
Kensington A

This course presents an overview of the end-to-end process for acquiring and applying vertical reference systems. It is geared toward people using tidal, LIDAR, and GPS measurements and explains how to apply the information more effectively to coastal issues. Students will learn the basics of tides, tidal observation and tidal datum determination, geodesy, geodetic observation, and geodetic datums. Case studies and examples are used to showcase the variety of applications and to illustrate how important known and consistent vertical reference systems are to the successful use of GIS. Applications include maritime boundaries, wetland restoration, coastal inundation from storm surge or sea level rise, land subsidence mapping, shoreline determination, and bathymetric surveys.

Training: Introduction to Remote Sensing
Kensington B

Remote sensing image data provide a unique perspective on environmental features and conditions. As access to remote sensing data increases, there are more data streams and options becoming available. This seminar provides an overview of remote sensing concepts and technologies, and addresses their uses as decision-making tools for managing spatial resources. The overview will cover topics essential to an understanding of the remote sensing process, including the basics of electromagnetic energy and its interaction with the environment, various types of image data (sensor systems and platforms) that are available, benefits and limitations of including remote sensing data, and examples of applying derived data to other GIS data in a decision-support system.

Training: Metadata – The Next Step
Kensington C

OK, so you know what metadata is and why it is important. Now what do you do? This session will help answer that question by looking at ways to implement a metadata program for your organization. Topics will include making metadata a part of your internal data management structure, establishing protocols and standard operating procedures to aid in staff buy-in and contractor consistency, and using tools to make the process of writing metadata as painless and efficient as possible.

SPECIAL INTEREST MEETINGS
1:00 to 4:30 p.m.

Special Interest Meeting: Comprehensive Hurricane Preparedness Study – GIS Tools and Applications
Kensington A

The Federal Emergency Management Agency (FEMA), U.S. Army Corps of Engineers, NOAA Coastal Services Center, and their state and local partners involved in emergency management and mitigation planning for tropical cyclone events will meet regarding the development of the new Comprehensive Hurricane Preparedness Study and the products that will be produced as a result. Though this will be a meeting of the project partners, others interested in hurricane preparedness are welcome to attend. The objective is to explore additional ways GIS tools can assist FEMA and local communities throughout the hurricane-prone areas of the U.S. and its territories in their preparedness, response, and recovery efforts.

Special Interest Meeting: FGDC Marine and Coastal Spatial Data Subcommittee
Kensington B

The Federal Geographic Data Committee's (FGDC) Marine and Coastal Spatial Data Subcommittee will hold a special interest meeting at the Coastal GeoTools conference. Topics will include the subcommittee's role in building the Marine and Coastal National Spatial Data Infrastructure; how the subcommittee is responding to the recent U.S. Commission on Ocean Policy and National Research Council recommendations; and other current activities. This is an opportunity to learn more about the subcommittee and how your organization might participate.

Special Interest Meeting: Remote Sensing of Coastal Water Quality
Kensington C

The NOAA Coastal Services Center has recently conducted a comparison of operational remote sensing technologies to measure water quality in nearshore waters. The Center contracted with four groups to collect measurements, using different types of remote sensing instruments, along the Patuxent River in Maryland. The groups measured chlorophyll concentrations, total suspended solids, and sea surface temperature. The Center plans to present a comparison of all of these data sets at this special interest meeting. The meeting will also be a forum for a discussion of the pros and cons of each approach. Managers, vendors, and scientists will all have an opportunity to ask questions, display findings, and discuss the current abilities the community has in this area.

WELCOME RECEPTION – EXHIBITOR RECEPTION AND POSTER SESSION
6:00 to 8:00 p.m.

Meet the exhibitors and poster presenters in the rooms adjoining 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.

Tuesday, March 8

WELCOME AND KEYNOTE ADDRESS
8:30 to 10:00 a.m.
Kensington Ballroom

NOAA Coastal Services Center Welcome

Nicholas Schmidt, Chief, Coastal Information Services, NOAA Coastal Services Center, Charleston, South Carolina

NOAA Welcome

Margaret A. Davidson, Director, NOAA Coastal Services Center, Charleston, South Carolina

Ms. Davidson earned her juris doctorate (J.D. degree) in natural resources law from Louisiana State University and her master's degree in marine policy and resource economics from the University of Rhode Island. After a two-year stint as the acting Assistant Administrator of NOAA's National Ocean Service, she has returned to the position of Director of the NOAA Coastal Services Center.

Keynote Address

Dr. Michael Goodchild, Professor of Geography at the University of California, Santa Barbara, and Director of the National Center for Geographic Information and Analysis (NCGIA).

Dr. Goodchild has a B.A. in physics from Cambridge University and a Ph.D. in geography from McMaster University. He taught from 1969 to 1988 at the University of Western Ontario and has been at the University of California, Santa Barbara, since 1988. He has written and lectured widely on spatial analysis and geographic information systems (GIS). His recent research and published work is on the topics of error and uncertainty in spatial data, spatial analysis in social sciences, and GIS and environmental modeling.

BREAK
10:00 to 10:30 a.m.

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

Remote Sensing Applications: High Resolution Data
Kensington A

A01. THE USE OF HIGH RESOLUTION IMAGERY IN CREATING AN ACCURATE SHELLFISH MAP AND ITS APPLICATION TOWARD IMPROVING SHELLFISH HABITAT
Karen M. Cullen, Town of Hilton Head Island

The Town of Hilton Head Island used GPS technology to map shellfish beds in a section of Broad Creek in 2000. While this produced highly accurate polygons, time and access constraints rendered this methodology impractical for mapping the entire creek. At about that time, the NOAA Coastal Services Center and SC DNR teamed up with the Town to identify a methodology to map all shellfish beds in the state using remote sensing technology. The Town received draft half-meter digital imagery as well as preliminary polygons depicting the extent of shellfish beds for Broad Creek. Town staff performed a verification analysis on this data and reported the results to the CSC where they were used to further modify the polygon identification techniques.

Since that time, the decision was made to use quarter-meter digital imagery as the base for identifying polygons (shellfish beds). The more accurate data resulting from this will be supplemented with strata data gathered in the field.

The Town plans to use this data for several purposes: identify development impacts which create unfavorable conditions for shellfish and determine whether mitigation can be done to improve the habitat; identify potential shellfish restoration sites; and identify shellfish beds significantly impacted by boat wakes to determine if additional regulation on boat speeds would be appropriate. If available in time, samples of the quarter-meter imagery-based data will be used for these analyses. This presentation will discuss the data collection and verification results, and will concentrate on the use of the data by the Town to improve water quality and conditions for shellfish in the creek.

A02. NEXT GENERATION LANDCOVER MAPPING: THE FACE OF THE FUTURE
Andrew Brenner and Rick Jones, Space Imaging

The primary objective of this paper is to describe, detail and demonstrate a methodology that will successfully introduce high spatial resolution data and land cover products into the current Coastal Change analysis Program (C-CAP) program. The proposed approach is flexible and lends itself to multiple sensors, and accommodates the needs of multiple users. The focus of this proposal is to produce a cost effective operational system for systematically updating the C-CAP land cover using high resolution imagery.

The methodology consists of a dual resolution approach looking aimed at both coastal monitoring and site-specific analysis for specific projects. The coastal monitoring consists of a resolution that is less than 30m where the requirement for inexpensive imagery and low processing costs enable processing of a large area relatively efficiently and rapidly. The site specific approach meets requirements where very high resolution imagery (~1m) is required to meet the needs of individual projects. The dual resolution approach is key where there are multiple requirements for the information generated from the imagery. In addition, leveraging land cover mapping methodology and datasets previously generated decreases both the processing time and maintains consistency between the products.

A03. DETECTION OF WETLAND VEGETATION AND VEGETATION CHANGE USING HIGH RESOLUTION HYPERSPECTRAL REMOTE SENSING

Francisco Artigas, Jason Yang, Robert Ceberio, Irfan Bora, and Edward Bulmer, The Meadowlands Environmental Research Institute, University of Rhode Island

The preservation of wetlands and management of invasive species requires accurate knowledge of their spatial distribution and density. Current wetland maps of the Hackensack Meadowlands District in Northern New Jersey lack detail information on the spatial distribution of salt marsh vegetation. The accuracy of salt marsh vegetation mapping is usually challenging because salt marshes and tidal mud flats are difficult to access for verification purposes and are highly prone to natural disturbances such as storm events and flooding. Also, within a patch, a single species may prevail, but other marsh surface types such as exposed mud and surface water are also present. Finally, a single species may have more than one physiognomic type depending on where it develops: stunted growth forms prevail in waterlogged sites, whereas tall vigorous forms of the same species prevail in well-drained sites. The availability of Airborne Imaging Spectrometer for Application (AISA) imagery with fine spatial resolution (2.5 × 2.5 m) and high spectral resolution (34 continuous spectral bands between 350-850 nm) provides a suitable tool for mapping individual marsh species and their physiognomic types. This presentation will show how we used high resolution hyperspectral remote sensing to detect and map marsh vegetation distribution and track vegetation changes between 2000 and 2004. The first objective was to compare a spectral libraries versus spectral un-mixing approach to classification for mapping *Phragmites australis*, *Spartina alternifora*, *Spartina patens* and *Distichlis spicata* and mixtures of these along with exposed mud and water surfaces. The second objective was to detect—based on the classification results—changes in vegetation distributions between 2000 and 2004 and evaluate the expansion of the invasive *Phragmites australis* communities at key locations. The presentation will show the results of marsh vegetation mapping using different classification methods which were then verified against an extensive number of known field control points. To end, the implications of changing and emerging invasion fronts of *Phragmites australis* is discussed in relation to the hydrology and existing native marsh plant communities.

Coastal Mapping and Shoreline Change: Shoreline Stabilization
Kensington B

A04. REEF BALLS FOR SHORELINE STABILIZATION AT MACDILL AFB

Jason Kirkpatrick, MacDill Air Force Base

The shoreline stabilization project is a five-year, five-phase project initiated by the Air Force and supported by Federal and local partners including the USFWS, NOAA, Tampa Bay Watch, and community volunteers. The shoreline has experienced rapid erosion in the past decade. The exact cause of the increased erosion is unknown but increased ship traffic in Tampa Bay may be a cause. As the sand erodes, native plant species such as black mangroves, palms and 100-year old live oaks are lost. The project aims to create a series of oyster reefs along a 1/2-mile of undeveloped shoreline at the southeastern tip of the Interbay Peninsula.

The demonstration phase (Phase I), completed between January and June 2004, securely installed more than 900 marine-friendly, concrete reef balls and nearly 32 tons of oyster shell to form an 800-foot long, multi-section “reef” to reduce wave energy before it hits the southeastern shoreline. The reef balls encourage the establishment of oyster and mussel colonies, which filter the water and provide valuable habitat for fish and other aquatic resources. The oyster domes were installed approximately 100 feet off shore in shallow water (~2 ft deep at high tide). The wave reduction

barrier also encourages the establishment of sea grass and native marsh grasses which further assist shoreline stabilization efforts. Military and civilian volunteers installed the reef balls and oyster shell bags during five “reef building events.” Students from a local high school planted the area behind the reef with marsh grass (*Spartina alterniflora*).

A05. RATES AND PROCESSES OF SHORELINE CHANGE AT FORT PULASKI NATIONAL MONUMENT, GA: A GIS-BASED ASSESSMENT

Susan Howell, Applied Coastal Research Laboratory and Department of Geology and Geography, Georgia Southern University
Clark Alexander, Skidaway Institute of Oceanography

Fort Pulaski is a Civil War era fort located on Cockspur Island, GA adjacent to the Savannah River shipping channel. To date, no quantitative evaluation has been made of the impact of port maintenance activities on natural and cultural resources within the Park. The objective of this study is to provide relevant information to Fort Pulaski staff so they may effectively comment on a proposal to deepen the shipping channel and devise a management plan.

In order to assess shoreline change rates over the period 1850-2000, we are developing an archive of visual imagery sources, including T-sheets, aerial photographs, surveys of channel depth, IKONOS imagery and side scan sonar surveys. Major features examined include the island shoreline and a large, dynamic oyster shell bar located along the Savannah River. These features were digitized to determine change rates for time periods that span major channel deepenings. The digitized shorelines were also used to determine endpoint shoreline change rates for the entire period of historic data. To analyze short-term dynamics of the oyster shell ridge, data collected includes progradation rate, length, height and width of the oyster ridge and distance from historic features. A series of benchmarks parallel to and adjacent to the oyster shell ridge allow measurement of onshore migration along its length. Information and results are being compiled outlining the rates of shoreline change and the dynamics of the oyster shell ridge over 10-100 year timescales, as well as changes associated with major harbor deepenings.

A06. ASSESSMENT OF SHORELINE STABILIZATION USING DIGITAL ORTHOPHOTOGRAPHY, GLOBAL POSITIONING SYSTEMS AND GIS

John F. Dobosiewicz, Kikombo I. Ngoy, and William C. Heyniger, Department of Geology and Meteorology, Kean University

The New Jersey shoreline has been altered persistently and ubiquitously by human modifications. Human modifications can be classified as hard or soft shoreline stabilization. Hard shoreline stabilization includes bulkheads, seawalls, revetments, groins, and jetties. Soft shoreline stabilization includes beach nourishment and dune construction. This paper will evaluate changes in some estuarine and oceanic shoreline stabilization projects in New Jersey. Change will be evaluated over the past decade using a combination of remote sensing and field study techniques. The state of New Jersey has commissioned two aerial surveys resulting in digital orthophotography available for 1995 and 2002. Orthophotos combine the image characteristics of a photograph with the geometric qualities of a map. The 1995 digital orthophoto is a 1-meter ground resolution, quarter-quadrangle image cast on the Universal Transverse Mercator Projection on the North American Datum of 1983. The 2002 digital orthophoto is a sub-meter ground resolution image cast using the same projection and datum as the 1995 image. The 1995 and 2002 digital orthophotos will be mapped and evaluated using spatial analysis tools in ArcGIS™ and IDRISI™ platforms. A field study will be used to assess the current (2004) aerial extent of beach nourishment, dune

construction, and hard shoreline stabilization at an estuarine site and an ocean site. Critical points along the shoreline, such as the location and extent of seawalls and bulkheads, the location and length of groins and jetties, and the cross sectional distances of beach nourishment and dune construction will be mapped using global positioning systems. The field data will be imported and displayed in ArcGIS™ with digital elevation data and compared to the 1995 and 2002 digital orthophotography.

Hazards: Vulnerability Assessment
Kensington C

A07. A TROPICAL WEATHER VULNERABILITY ASSESSMENT FOR TEXAS COASTAL COUNTIES

Richard W. Dixon, James and Marilyn Lovell Center for Environmental Geography and Hazards Research, Department of Geography, Texas State University

A tropical weather vulnerability index (TWVI) is developed for the Texas coast. The TWVI includes both tropical storm and hurricane impacts in Texas and accounts for the edge effect of systems making landfall in Louisiana or Tamaulipas. TWVI includes measures of both risk and exposure. Risk is measured by the number of landfalling tropical weather systems, while exposure incorporates both population and property in coastal counties. Analysis of the TWVI shows the northern part of the coast to be more vulnerable than the central or southern parts.

A08. GIS-BASED AUTOMATED VULNERABILITY ASSESSMENT TOOLS FOR THE COASTAL RISK ATLAS

Jason L. Stradtner, Neptune Sciences, Inc., NOAA National Coastal Data Development Center

The Coastal Risk Atlas (CRA), developed in collaboration with the NOAA Coastal Services Center (CSC) and based on their Community Vulnerability Assessment Tool (CVAT), identifies and provides access to required data and proven analysis techniques. This information then allows users to perform vulnerability assessments for their community. These assessments incorporate data such as hazard modeling, critical facilities and infrastructure, environmental resources and land-use, and demographic estimates to paint a picture of how an area might be affected by a hazard event. Once hazards are identified, they are assigned a vulnerability index (VI) relative to the degree of risk posed to an area. Likewise, demographic profiles are assigned a VI relative to their susceptibility to hazard events, inability to recuperate after an event, and/or lack of adequate resources to prepare for and/or endure an event.

To provide users the ability to complete individualized vulnerability assessments, we developed the Vulnerability Assessment Toolbar (VAT), a downloadable GIS extension for the ESRI ArcGIS 8.x desktop software. This toolbar consists of three separate tools. The Join tool simply expands on existing functionality. The Demographic Vulnerability Assessment Tool (DVAT) allows users to specify a VI based on tolerances regarding specific populations. The Multi-Hazard Vulnerability Assessment Tool (MHVAT) allows users to specify a VI based on tolerances regarding specific hazard events. These wizard-based tools walk users through completing a vulnerability assessment; allowing them control over file and field naming, range thresholds, and VI values. Users also have the option of creating layer(s) showing gradient symbology. All processing tasks are handled behind the scenes. The objective is to simplify the vulnerability assessment process to a point that allows users to control the scoring schema while ensuring a degree of consistency in the assessment process.

A09. DEVELOPMENT OF A COMPREHENSIVE GIS PARCEL DATABASE FOR THE COASTAL HAZARD ZONE OF LAKE ONTARIO

Pete Zuzek, Baird & Associates
Tom Bender, U.S. Army Corps of Engineers, Buffalo District
Ralph Moulton, Environment Canada

Baird & Associates has recently developed a comprehensive digital property parcel database for the coastal hazard zone of Lake Ontario. This endeavor was part of a much larger investigation for the International Joint Commission (IJC), who is presently re-evaluating the operational procedures for the Moses-Saunders Power Dam in Massena, New York. The current procedures, also known as the regulation plan, control the water level of Lake Ontario and the flow of the St. Lawrence River. The parcel database was required to complete the impact evaluation for alternative plans on riparian property.

Considering the study area included over 4,000 km of shoreline, assembling and attributing the parcel database could only be approached with GIS technology and custom software applications. The first step was obtaining the raw parcel layers from over 20 county governments. Second, in addition to standard attributes, such as owner, street address, and assessed value, the study required data specific to a coastal hazard assessment, such as: distance of dwelling to shoreline, land elevation at dwelling, type and quality of shoreline protection, and parcel dimensions, such as lake frontage. Since the database included over 20,000 parcel records, custom tools were required to complete the task in an efficient manor. Therefore, an ArcGIS extension known as “Baird Parcel Tools” was developed to assist the GIS Operator with this daunting task.

Once attributed, the parcels were exported from GIS and imported into a Microsoft Access Database for use in the economic evaluation for the study. This paper will describe the methodology followed to build the parcel database, plus the many value added applications for coastal zone management on Lake Ontario. For example, agencies such as the NY State Department of Environmental Conservation have been engaged to explore opportunities for their use of this geospatial dataset.

Land Use and Community Planning: Coastal Conservation
Kensington D

A10. FILLING DATA NEEDS FOR COASTAL CONSERVATION

Moderator: The Nature Conservancy

Coastal areas are among the most developed in the nation. Conservation planning, from regional to local scales, is urgently needed to protect critical resources in and adjacent to America’s most heavily used and expensive real estate. Coastal resource protection can provide numerous public benefits such as improved water quality, increased access to shoreline areas, conserved wildlife habitat, and sustained recreational and commercial fisheries. Many organizations are working to support coastal conservation planning, and reliable and accessible data on coastal and marine resources is a key element of successful efforts.

In this session presenters will highlight work focused on acquiring, managing, and disseminating data to support coastal conservation planning. Panelists will share their process and progress on data issues in conservation planning projects ranging from regional to local in scale. Topics will include the development of data and information systems, partnerships forged to leverage data acquisition, and a data dissemination program that is delivering regionally consistent conservation data to municipalities. There will be time for questions and discussion from session participants.

LUNCH
12:00 to 1:30 p.m.
Exhibitor Hall Open; Kensington E and F
Poster Viewing: Oxford, Winchester, and Pembroke

EARLY AFTERNOON SESSIONS
1:30 to 3:00 p.m.

Benthic Mapping: Techniques I
Kensington A

B01. SPATIAL MULTIMEDIA SUPPORTS COASTAL AND BENTHIC MAPPING
Carol Snyder and Norton Ewart, Red Hen Systems, Inc.

Coastal and benthic habitat mapping are essential for management and preservation of land based and aquatic resources. NOAA has developed useful guidelines for data gathering techniques depending on habitat scale in the area of interest. “Macro” scale habitats are those that encompass greater than 100 square meters and generally are sampled with side-scan sonar, multi-beam and single-beam bathymetry, aerial photography, and satellite imagery. “Micro” scale refers to features typically below one square meter in size and are best sampled with methods such as plan-view photography, sediment profile imaging, sediment cores, grabs, and videography.

Field experience is showing that only through combining techniques are scientists establishing the most complete view of a coastal habitat. Collection of quality data and accurate placement is essential to identifying spatial resource distributions. These distributions are critical to the characterization and management of these natural resources.

According to NOAA Coastal Services Center, “no method of a benthic mapping effort is more critical to project success than collecting source photography at the proper specifications and under the optimal environmental conditions.” Spatial multimedia tools are in use which integrate digital still and video data streams with GPS location, synthesizing them into an interactive mapping framework to provide quick and easy access to collected information. This provides a visual “what is where” experience maximizing the results of data collection trips. This field level multi-media information is used to ground truth and verify information traditionally identified in a mapping framework.

Several examples of practical application will be presented demonstrating how resource managers are employing spatial digital imagery data from a variety of methods including low altitude aerial, underwater, and surface level surveys.

B02. BENTHIC HABITAT MAPPING IN TROPICAL MARINE ENVIRONMENTS USING QUICKBIRD MULTISPECTRAL DATA
Deepak R. Mishra, Sunil Narumalani, Donald Rundquist, and Merlin Lawson, Center for Advanced Land Management Information Technologies (CALMIT), University of Nebraska–Lincoln

The objective of this research was to develop an accurate benthic habitat map for the northwest area of Roatan Island, Honduras using high resolution multispectral QuickBird data. Atmospheric (Rayleigh and aerosol path radiance), and water column corrections (water depth, and water column attenuation) were applied to the imagery, making it a robust method for mapping benthic habitats.

Water depth for each pixel was calculated based on a linear regression model that estimated water depths by regressing transformed radiance over known homogenous benthos against depths. Water column correction was performed by deriving absorption and backscattering coefficients for each band of the image using a 50×50 window of clear water pixels. Corrections for water path radiance and water column attenuation of the bottom reflected radiance were made for the entire scene, allowing the bottom albedo to be determined for shallow coastal areas.

An image of the bottom (i.e., an albedo image), without the water column, was produced. Albedos for various benthic habitats were <10% for seagrass, 10-18% for corals, and >18% for sand dominated areas. An unsupervised classification algorithm (ISODATA) was applied to the bottom albedo image, generating a classified map of benthic habitat. Accuracy assessment based on 383 reference points revealed an overall accuracy of 81%, with the Kappa coefficient being 0.774.

B03. MAPPING PACIFIC ISLAND CORAL REEF ECOSYSTEMS WITH MULTIBEAM AND OPTICAL SURVEYS
Emily Lundblad, Joyce Miller, John Rooney, Megan Moews, and Joe Chojnack, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Contractor to NOAA Fisheries, Pacific Islands Fisheries Science Center
Jonathon Weiss, University of Hawaii

The National Coral Reef Action Strategy and the U.S. Coral Reef Task Force have established goals for complete mapping of U.S. coral reefs by 2009. Researchers and scientists at the Pacific Islands Fisheries Science Center (PIFSC) are making significant progress in mapping Pacific Island coral reef ecosystems. PIFSC’s Coral Reef Ecosystem Division (CRED) is collecting multibeam bathymetry and backscatter imagery around United States flag territories in the South and West Pacific and around the Hawaiian Islands. The data from these surveys provide a wealth of information for managing ecosystems, fisheries, protected species, socio-economics and other critical areas of assessment. In February and March of 2004, CRED achieved ~80% coverage of the seafloor in territorial waters around Tutuila and the Manu’a Group in the Territory of American Samoa between 20m and 250m depths. The data were collected aboard the *R/V AHI* (Acoustic Habitat Investigator) with a 240-kHz RESON 8101ER multibeam echosounder. In addition, CRED collected photographic and video validation data in 2002 and 2004 around all the islands and atolls of the territory. This validation data aids in interpretation of the high resolution multibeam bathymetry (1m – 10m) and sidescan imagery (sub-meter resolution). A smaller set of multibeam bathymetry was collected in November 2002 by researchers at Oregon State University (OSU) and University of South Florida in collaboration with Fagatele Bay National Marine Sanctuary and CRED. These data were analyzed for benthic habitat classifications at OSU using derivatives of bathymetry: slope, bathymetric position index, and rugosity. These analyses overlap and extend shallow water habitat classifications that NOAA’s Biogeography Program has completed around the territory using IKONOS satellite imagery. With further interpretation of the more extensive data set, these existing classifications are being extended and combined for regional characterization of benthic habitats from the shoreline to 250m water depths.

Coastal Mapping and Shoreline Change: Shoreline Databases
Kensington B

B04. DEVELOPMENT OF A NATIONAL-SCALE SHORELINE CHANGE DATABASE
Donald K. Stauble, U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory

Data on representative shoreline positions, historic shoreline locations, erosion rates and areas of critical erosion are being collected, on a state-by-state basis from various existing Federal, State and local government programs related to shoreline change as part of the National Shoreline Management Study (an interagency effort of Federal and State Agencies concerned with shoreline management). Shoreline datasets are being incorporated into a GIS database to provide a single source of what are now a diverse and widespread assortment of information on shoreline change and the state of local beach conditions. To understand coastal erosion and accretion patterns, identify shore protection problems, and to provide guidance on management of sand resources, the compilation of shoreline data on a nationwide basis is needed. The database is divided into a collection of digital base shorelines, historic shore positions, historic erosion rate calculations and identification of coastal erosion areas from all 30 coastal states along the Atlantic, Pacific, Gulf of Mexico and the Great Lakes, as well as the Island territories of Puerto Rico, Virgin Islands, Guam, Samoa and the Northern Mariana Islands. Sources of shoreline positions and change information in digital format are available from several Federal agencies and many State coastal zone programs and are being downloaded into the inventory by state. Most data is of a high-resolution scale ranging from 1:10,000 to 1:40,000, not available in any other national database. Details of available data by state are given along with the metadata listing such information as source and collection method, dates shoreline was mapped, coverage area and other information on shoreline type, use and ownership. This single source of unified information on shoreline change will provide a resource for further study of the state of the nation's coastline and how to manage regional sediment programs.

B05. NOAA'S PACIFIC ISLANDS ASSISTANTSHIP PROGRAM AT WORK ON GUAM: BUILDING LOCAL SPATIAL TECHNOLOGY CAPACITY AND PROVIDING SUPPORT FOR COASTAL MAPPING PROJECTS
David R. Burdick, Environmental Careers Organization for NOAA

In an on-going effort to improve the efficiency and effectiveness of coastal resource management in the state of Hawai'i and the U.S. Pacific territories, the United States National Oceanic and Atmospheric Administration (NOAA) provides their coastal and marine resource management communities with the latest information, technology, and training. The NOAA Pacific Islands Assistantship Program, first implemented in 2001, provides each state/territory with an assistant who helps to improve the quality and quantity of spatial data, provides Geographic Information System (GIS) support for research projects, and provides GIS training to the coastal zone management community. The 2004-2006 assistant for Guam works jointly with the Guam Coastal Management Program (GCMP) and the University of Guam Marine Lab on a variety of capacity building and coastal mapping projects. One of the primary objectives of the assistantship program on Guam is to increase the application of spatial technologies, including GIS and the Global Positioning System (GPS), within the GCMP and its networking agencies. This is being accomplished by providing hardware and software and by conducting weekly training sessions and more extensive, agency-specific training sessions. Guam's assistant also provides GIS support for several coastal mapping projects, such as the mapping of Essential Fish Habitat at various Western Pacific locations, as well as the production of a detailed coastal atlas for Guam. Other tasks include updating Guam's ArcIMS site, facilitating the development of spatial data standards, developing and teaching a one-credit hour GIS course for University of Guam graduate students, and organizing and updating Guam's GIS data and associated metadata.

B06. SHORELINE CHANGE IN THE SAIPAN LAGOON
Hilary Stevens, Coastal Resources Management Office, Commonwealth of the Northern Mariana Islands

The island of Saipan, the largest of in the Northern Mariana Islands, has undergone considerable shoreline change over the past several decades. The population has increased dramatically in that time, with the change from military presence to a tourism-based economy. The island's west coast faces a large lagoon and is the most densely developed area. American Memorial Park is a particularly dynamic site. Erosion of its popular tourist beaches has caused public concern.

This study investigates shoreline change using field measurements and analysis of historical photographs. The Emory method is used to take beach profiles of the most active areas along the lagoon. These measurements are taken monthly and around major storm events to document seasonal and short-term changes. For the historical aspect of the study, vertical aerial photographs of the western coastline are the best images available. These images show significant changes. The images are being compared using the Digital Shoreline Analysis System 2.0, which was developed by USGS. The causes for the shoreline change are currently under investigation. A better understanding of the causes and effects of shoreline movement in this area will lead to improved planning and management.

Coastal Hazards
Kensington C

B07. BACTERIAL LOADING, SOURCE TRACKING, AND BMP PERFORMANCE AT A LOWCOUNTRY GOLF COURSE
R. Heath Kelsey, Baruch Institute for Marine and Coastal Sciences, University of South Carolina
Geoffrey I. Scott, NOAA Ocean Service, Center for Environmental Health and Biomolecular Research
Dwayne E. Porter, Baruch Institute for Marine and Coastal Sciences and the Arnold School of Public Health, University of South Carolina
Tom Siewicki, NOAA Ocean Service, Center for Environmental Health and Biomolecular Research
Don Edwards, University of South Carolina

A detention pond and grassed swale Best Management Practice (BMP) complex at a lowcountry golf course was studied to evaluate bacterial loading, and the effectiveness of BMPs in removal of fecal coliform bacteria. Intensive sampling was conducted during storm events to quantify bacterial concentration and stormwater flow at 20 minute intervals, prior to and after each BMP. Based on the results, fecal coliform bacterial load and removal efficiencies were calculated for the detention pond and grassed swale. Preliminary results suggest that the BMPs at this site are minimally effective at removing fecal coliform bacteria from stormwater.

Bacterial source tracking was also performed at the site, to link potential bacteria sources to the bacteria observed in the detention pond. *E. coli* bacterial isolates were obtained from both surface waters in the detention pond and from animal scat obtained in the study area watershed. DNA analyses on these isolates were performed using ribotyping, to assess similarities between the

isolates found in the surface water and from fecal samples from local animals. Ribotyping results indicate that raccoons are the most common contributors of fecal pollution into the study area detention pond.

B08. WISCONSIN SHORES: DVD FOR COASTAL HAZARDS EDUCATION IN WISCONSIN
Alberto Vargas, Wisconsin Coastal Management Program

The Wisconsin Coastal Management Program (WCMP) though the Coastal Hazards Work Group has been working in the past few years in a strategy to address the issue of coastal erosion in Wisconsin's Great Lakes shoreline. One component of this strategy is an educational and outreach campaign to inform interested parties about the risks and potential solutions related to the coastal erosion.

In the Fall of 2002 a massive landslide affected several homes in the Village of Oliver, Douglas County. With support from Wisconsin Emergency Management through the Hazard Mitigation Grant Program the Village of Oliver acquired and demolished three of the seven affected properties.

The WCMP in collaboration with the Bayfield County Land Record Department and Hungry Hill Media produced a 20 minute DVD to communicate to the public the risks of coastal hazards in Wisconsin. The DVD uses visualization techniques to illustrate coastal bluff erosion and presents the point of view of the property owners, scientists, local officials and state agencies in dealing with this issue.

The presentation will describe the conceptualization of the message in the DVD and will show a few segments. Copies of the DVD will be distributed to attendees.

B09. NEW PARAMETERIZATION SCHEME FOR WIND INPUT AND SURFACE ROUGHNESS FOR SPECTRAL WAVE MODELS – WITH PARTICULAR EMPHASIS TO HURRICANES AND TROPICAL STORMS
S.G. Sajjadi, Center of Higher Learning, University of Mississippi
P.J. Fitzpatrick, GeoResources Institute, Mississippi State University
Y. Li, GeoResources Institute, Mississippi State University
E. Valenti, WorldWinds, Inc.

A generalization of the quasi-laminar model is constructed by averaging the linearized equations of motion for a turbulent shear flow in the direction parallel to the crest of the Stokes wave. It is shown that the resulting mean momentum transfer comprises: (i) a singular part, which is proportional to product of the velocity-profile curvature and the mean square of the wave-induced vertical velocity in the critical layer, where the mean wind speed is equal to wave speed; (ii) vertical integral of the mean product of the vertical velocity and the vorticity ω, where ω is the wave-induced perturbation in the total velocity along a streamline of the y-averaged motion; (iii) the perturbation in the mean turbulent shear stress at the air-water interface. A closure model, based on Townsend (1976) and Sajjadi (1998), is constructed for the specification of turbulent Reynolds stresses. The growth rate of the Stokes wave is then calculated from the derived expressions for the momentum flux for both slow and fast wind-wave regimes. In the slow wave regime the results agree well with Belcher and Hunt (1993) rapid distortion theory of turbulence over water waves. Moreover, in the fast wave regime the results agree well with the classical theory of Miles (1957). Further, the results of present calculations for the energy transfer parameter agrees well with the numerical integration of the Reynolds-stress transport equations over a Stokes wave (Sajjadi 2002), and also

with the numerical calculations of Ireley and Miles (2001). Also a new explicit parameterization is derived for the sea surface roughness that agrees well with the implicit formulation of Nordeng (1991) and with experimental data of Donelan et al (1993) in the slow-wave regime and with that of Charnock (1955) in the fast-wave regime. The newly derived expressions are then incorporated in a recently developed spectral wave model for shallow waters. A simulation was carried out with this spectral wave model for hurricane Isidore over Lake Pontchatrain, LA. The results of the simulation showed both qualitative and quantative agreement with observation in both wave directionality and significant heights.

Data Sharing I
Kensington D

B10. EMERGING ISSUES IN GEOSPATIAL METADATA
Lynda Wayne, Federal Geographic Data Committee, GeoMaxim

Geospatial metadata creators and producers are facing changes in GIS software capabilities, metadata publishing options, and national/international geospatial metadata standards. Tools such as ESRI's ArcCatalog and Intergraph's SMMS, fueled by metadata, allow for streamlined data management of GIS data. The Geospatial One-stop (GOS) program provides metadata publishing and data discovery via the e-gov portal, *geodata.gov.* The American National Standards Institute (ANSI) has adopted the International Organization for Standardization (ISO) metadata standard. This session will provide an overview of these and other emerging issues, and will provide specific recommendations that can be adopted to extend the life and utility of existing geospatial metadata records.

B11. INTERACTION BETWEEN COASTAL SEDIMENT DATABASES
Lyle Hatchett, URS Corporation
Jennifer Koch, Florida Department of Environmental Protection

Beach nourishment has become a very important area of study in the last few years. Beach renourishment projects as well as scheduled maintenance programs needed for the continued upkeep of beaches relies on the availability of readily sourced sand deposits. Databases are used to help identify and locate these deposits. The most comprehensive of these databases has been developed for The Florida Department of Environmental Protection (FDEP) Bureau of Beaches and Coastal Systems (BBCS). It is the Reconnaissance Offshore Sand Search (ROSS). Some of other databases include US Seabed, CIRC/ICON, and SUDS databases of the United States Geological Survey; Inlets Online of the Army Corp of Engineers; SC Intermar Database of the Minerals Management Service; and the InStaar dbSEABED database of the University of Colorado.

Information stored in these databases is varied. For example, along with other data types found in these databases, ROSS contains data on individual samples and cores. This data includes location, granulometry, and core layer descriptions. Geophysical data is also available through ROSS. These data are in the form of sub-bottom profile and side scan sonar images. SC Intermar also contains individual samples and cores as well as sub bottom profile, side scan sonar images, and bottom photos. US Seabed has data related to sample location and grain size; SUDS contains location information; and dbSEABED includes data on physical parameters of samples.

Several of these databases have been developed in conjunction with interactive web sites. This allows users to spatially view the data stored as well as conduct queries to the database. This paper compares and contrasts these and other databases and discusses methods that can allow the combined resources of these databases to be applied.

B12. SPATIAL ANALYSIS OF FISHERIES DATA IN CHESAPEAKE BAY: MAKING SENSE OF THE DATA AND TOOLS TO ANALYZE IT
Paula Hill Jasinski, NOAA Chesapeake Bay Office
Bernadita Anulaction, NOAA Northwest Fisheries Science Center
Derek Orner, NOAA Chesapeake Bay Office

Numerous tools now exist to help analyze spatial data. Do ease of use and access to these tools actually further our understanding of data sets or often lead to misrepresentation of results? NOAA Chesapeake Bay Office has applied several tools to various fisheries monitoring data sets available in Chesapeake Bay. The results we got varied, as did expert reviews we conducted on their meaning.

As we strive to create ever more efficient monitoring programs, we must also strive to understand how to best analyze the data they produce. An abundance of data is only as good as its analysis. This presentation will discuss the varied results from using the same data in different analytical tools. Because management agencies depend on regional expertise, the implications for policy development can be critical. As management move towards an ecosystem-based approach, it is important that we are mindful of the tools used to get there.

BREAK
3:00 to 3:30 p.m.

LATE AFTERNOON SESSIONS
3:30 to 5:00 p.m.

Benthic Mapping: Techniques II
Kensington A

C01. SEAFLOOR MAPPING IN THE FLOWER GARDEN BANKS, NORTHWESTERN GULF OF MEXICO
Douglas Weaver, Emma Hickerson, and George Schmahl, NOAA Flower Garden Banks National Marine Sanctuary
Shepard Smith, NOAA Ship Thomas Jefferson
Danny Neville, Interactive Visualization Systems

The Flower Garden Banks National Marine Sanctuary (FGBNMS) includes East and West Flower Garden Banks (FGB), located approximately 185 km south of the Texas/Louisiana border. East and West FGB harbor the northernmost living coral reefs (17-50m) on the continental shelf of the United States, and a diversity of deepwater (50 to 150m) marine habitats. Bathymetric surveys of EFGB, WFGB, and Stetson Bank have been conducted since the 1930's using single beam echosounders, and were surveyed in the 1990's using high-resolution multibeam echosounders (MBES). However, areas of the outer shelf and upper slope surrounding the sanctuary were poorly mapped, and deepwater reef communities between East and West FGB were unknown.

During April 2004, a hydrographic survey was conducted aboard the NOAA Ship *Thomas Jefferson* to provide information on habitat distribution and classification to the FGBNMS, and provide a source of bathymetry for updating existing National Ocean Service (NOS) charts. Data were acquired by the NOAA Ship *Thomas Jefferson* using a Simrad EM1002 MBES and GPS-aided inertial navigation system. NOAA launches 1014 and 1005 acquired multibeam data with GPS-aided inertial navigation systems and RESON 8125 and RESON 8101 MBES, respectively.

High-resolution multibeam mapping of the mid- to outer continental shelf resulted in the discovery of previously unknown features on the seafloor. A series of mud volcanoes, a deep reef escarpment, a submarine canyon, and hundreds of deep patch reefs were identified, providing a continuous network of deep reef communities between East and West FGB. Numerous mud volcanoes were identified along the upper continental slope, ranging from 200 to 1800m in diameter. Multibeam bathymetry data were incorporated into Arcview 3.2 projects as geo-tiffs, and as 3D maps using Fledermaus Interactive Visualization Systems.

C02. DELAWARE BAY BENTHIC MAPPING PROJECT
Robert Scarborough and Bart Wilson, Delaware Coastal Programs
John Madsen, Geology Department, University of Delaware

The Delaware Bay represents almost one quarter of the surface area of the State of Delaware. What lies under the Bay is one of the least understood areas of the State. Coastal management decisions are routinely made with little knowledge of how they will affect the Bay, its resources and the related economics of commercial and recreational activities. These decisions can range from designating areas of essential fish habitat to issuing dredging permits.

The Delaware Department of Natural Resources and Environmental Control is undertaking a Delaware Bay benthic and sub-bottom mapping project "To identify and map the benthic habitat and sub-bottom sediments of the Delaware Bay, and supply this information in a form decision makers and stakeholders can easily use that will aid them in their efforts to manage and conserve the Delaware Bay's resources."

This project involves the use of three types of acoustical instruments: RoxAnn seabed classification system, Chirp sub-bottom profiler and a multi-beam bathymetric sampling system, to characterize the benthic habitat and sub-bottom sediments of the bay. The RoxAnn system determines the roughness and hardness of the benthic surface to characterize the benthos. The Chirp sub-bottom profiler provides data on the sediments up to 30 feet below the bottom of the bay, while the multi-beam sonar provides a complete image of the Bay bottom, showing the topographic relief. The data is verified with numerous shallow and deep sediments samples and video. All this information is statistically analyzed and correlated into numerous GIS maps enabling coastal decision makers to manage this coastal resource effectively.

C03. MARINE APPLICATION OF ACOUSTIC BASE MAPS AND REALTIME GIS IN SHALLOW WATER ENVIRONMENTS
Yvonne Allen and Charles Wilson, Coastal Fisheries Institute
Harry Roberts, Coastal Studies Institute, School of the Coast and Environment
John Supan, Louisiana Sea Grant College at Louisiana State University

Coastal Louisiana faces continued landscape alteration from natural and anthropogenic processes that affect estuarine habitat, yet shallow depths (1-4m) and high turbidity often combine to limit what is known about the distribution and extent of habitats in this dynamic environment. In this presentation, we outline several innovative applications that combine acoustic basemaps, realtime GPS display and acquisition, and other spatially relevant data layers for research, industry and management goals. We used groundtruthing with quadrat and dredge samples to build a quantitative relationship with sidescan sonar imagery. The classified imagery was then used to further stratify ecological and geological sampling.

The Louisiana oyster grower has long relied on coarse benthic maps and personal historical knowledge to best manage an oyster lease. In a production and harvesting operation, sidescan sonar together with realtime positioning and GIS holds great promise for allowing spatially-based management of oyster harvesting, seeding, obstruction avoidance, gear recovery, and planning future enhancement possibilities. For growers that manage a large quantity of leased area, it may also offer dramatically increased efficiencies by reducing training costs and more effectively targeting resources.

Acoustic basemaps hold great promise as a management tool for establishing a baseline against which future alterations may be measured. Sidescan sonar was used to: 1) determine the condition of substrates in advance of a freshwater diversion project designed to slow coastal land loss, 2) establish the disposition of artificial reefs, and 3) survey state oyster seed grounds to determine optimal areas to plant cultch to minimize losses due to subsidence.

Coastal Mapping and Shoreline Change: Shoreline Tools
Kensington B

C04. REGIONAL MORPHOLOGY ANALYSIS PACKAGE (RMAP)

Brian K. Batten and Nicholas C. Kraus, U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory

Typically, analysis of beach profile and shoreline position data requires several software packages. The engineering and numerical modeling work environment calls for tools directly supporting workflow in a geospatial environment, from the original surveys to quality control, analysis, and input to a project report or model. The Regional Morphology Analysis Package (RMAP) contains a comprehensive set of analysis and visualization tools required for project workflow, from the import of raw data and coordinate conversion through detailed analysis to report-quality graphics for geospatial data.

RMAP supports analysis of geo-referenced beach profile, channel or river cross-sectional data, and shoreline position data for engineering and science applications, replacing the Corps' Beach Morphology Analysis Package (BMAP). Capabilities extend from generation of spatially referenced shoreline change maps to a large suite of beach profile analysis tools. Data can be examined in both cross-sectional and map views to simplify data assembly, quality control and assurance, data analysis, and generation of report figures. The map viewer supports the display of geo-referenced profiles, shorelines, aerial imagery and ArcView® shapefiles. Data options allow storage, organization, and analysis of data in a single application, with support for a variety of import/export formats. Chart options allow tailoring of graphics to personal needs, supporting export of images and direct copy and paste into word processing software. Metadata can be stored at project, group, or individual data item levels. RMAP is backwards-compatible with BMAP project files and supports calculation of geographic coordinates from reduced distance-elevation data pairs.

Future improvements will include three-dimensional visualization and analysis tools, relational database framework, and additional shoreline and profile analysis functions.

C05. EVALUATING THE DIGITAL SHORELINE ANALYSIS SYSTEM (DSAS) FOR VIRGINIA SHORELINE CLASSIFICATION

Harry Berquist and Marcia Berman, Center for Coastal Resources Management, Virginia Institute of Marine Science

The first step in planning for a Virginia shoreline classification project was to review methodologies and approaches used to quantify shoreline change. Paramount to the adoption of an analytical approach was accuracy of the method, application across large systems that include multiple geomorphic settings, and comparability to existing datasets both temporally and spatially.

The Digital Shoreline Analysis System (DSAS) developed by the USGS in cooperation with Perot Systems Government Services extends the normal functionality of the **ArcView** version 3.2 (and later) geographic information system (GIS) to include historic shoreline change analysis. It has been used in several coastal states including Massachusetts and Maryland. A new version of DSAS for use with ArcGIS 9 is presently being tested.

Before adopting this protocol a pilot project using DSAS was initiated to evaluate the method in house and estimate the amount of effort to perform a shoreline change analysis for Virginia. A portion of Lancaster County, Virginia with a wide variety of shoreline configurations was chosen for this pilot project. The results, both numerical and experiential, will be reported.

C06. THE COASTAL GEOTOOLBOX: MAKING COASTAL GEOMORPHOLOGY DATA MORE ACCESSIBLE

Arthur Rodriguez, Assateague Island National Seashore, National Park Service
Mark Duffy, Northeast Coastal & Barrier Network, National Park Service
Bryan Milstead, Northeast Coastal & Barrier Network, National Park Service
Charles Roman, Cooperative Ecosystems Studies Unit, National Park Service
Peter August, Department of Natural Resources Science, University of Rhode Island
Chuck LaBash, Environmental Data Center, University of Rhode Island

In an effort to document changes in barrier island beaches, the National Park Service (NPS) Inventory & Monitoring Program Northeast Coastal & Barrier Network (NCBN) is monitoring a set of coastal geomorphologic indicator datasets. Two of the most important and readily available datasets are horizontal shoreline locations and lidar topographic surveys. Through interviews held at the four open-ocean National Park sites in the NCBN, it became apparent that managers and researchers within the Park Service were interested in using these shoreline and lidar data, but do not have the time or technical knowledge required to efficiently do so.

As a solution to this, the Coastal GeoToolbox was created, which is a GIS-based suite of automated procedures with the intention of simplifying the utilization of shoreline and lidar data. The Toolbox was created with the Visual Basic for Applications (VBA) programming language and ArcGIS 8.3. It is composed of a customized ArcMap (.mxd) document with a set of buttons that provide a suite of commonly used visualization and analysis tools. Included in the applications are an automated end point rate shoreline change analysis; a GUI-driven definition query of the NCBN shoreline database; loading a standardized legend for lidar grid datasets; calculating changes between lidar surveys; calculating volume from a lidar survey; and highlighting elevation ranges within a lidar survey.

Visualization Tools
Kensington C

C07. THE CHESAPEAKE BAY PROGRAM'S WATER QUALITY DATA INTERPOLATOR TOOLKIT
David Jasinski, University of Maryland Chesapeake Bay Program
Mark Trice, Maryland Department of Natural Resources
Mondher Chehata, Michael Monteith, and William Samuels, Science Applications International Corporation

The Environmental Protection Agency's (EPA) Chesapeake Bay Program (CBP) has for several years used a linear (inverse distance weighted) 2D/3D interpolator for the analysis of water quality and living resource monitoring data. This method has provided acceptable results. However, in the interest of improved statistical robustness and improved capabilities, CBP contracted Science Applications International Corporation (SAIC) to develop an improved water quality data interpolator toolkit. Because attainment of water quality standards will be assessed using this interpolator it was imperative that the interpolation technique be based on a statistical method. The interpolation tool kit which was developed is comprised of a stand alone data preprocessor, a VBA tool bar in ArcGIS Geostatistical Analyst (GA) and 3D grids and analysis methods in the GMS geostatistical module. Improved capabilities include 2D and 3D kriging (a geostatistical interpolation method), error estimates, interpolation/analysis within a GIS, inclusion of the pycnocline as a boundary in 3D kriging, the ability to analyze fixed station, towed-array and remote sensing data and improved data visualization.

C08. NEW TOOLS FOR VISUALIZING COASTAL HAZARDS ON THE GREAT LAKES
Jeffrey Stone and Mark Harrower, University of Wisconsin-Madison
David Hart, University of Wisconsin Sea Grant Institute
Ted Koch and AJ Wortley, Wisconsin State Cartographer's Office
Alberto Vargas, Wisconsin Coastal Management Program
Stephen Ventura, University of Wisconsin-Madison

Bluff erosion and flooding are the two most serious natural hazards facing coastal communities in Wisconsin. Although scientists have studied coastal geomorphology of the Great Lakes closely in recent years, this work often fails to communicate to a larger public audience and thereby stimulate a deeper understanding of the truly dynamic and unstable nature of many coastlines. Given both the complexity of the processes and the long time periods involved, many public officials, real estate developers, and coastal landowners do not fully appreciate either the inherent instability of desirable lakefront property or how some land-use practices may contribute to that instability.

A recently completed project, funded by NASA and the Institute for the Application of Geospatial Technologies at Cayuga Community College, successfully bridged the gap between scientific understanding and public perception by utilizing Web-based geovisualization tools to present integrated and scientifically informed views of coastal hazards. The website for the project (*www.geography.wisc.edu/coastal/*) includes interactive exhibits that creatively depict coastal change between 1956 and 1999, describe the cycle of bluff erosion, and show 3D fly-bys that demonstrate the integration of various digital terrain models and remotely sensed imagery. The momentum of the project has been continued with funding from the University of Wisconsin Sea Grant College Program. Objectives include moving beyond the existing 2D coastal change exhibits by developing a Coastal Terrain Model (CTM) which merges the high quality topographic mapping with near-shore bathymetric LIDAR data, using the CTM to explore the physical and ecological impacts of lake level change, and exploring coastal development setback alternatives. We will demonstrate

the educational products developed as part of the project, discuss issues associated with the spatial data and software tools used, and describe our community outreach efforts in Ozaukee County, Wisconsin.

C09. VISUALIZATION AND KNOWLEDGE TRANSFER FOR GULL LAKE EROSION MODELING USING ARCPUBLISHER AND ARCREADER
Steve Langendyk and Pete Zuzek, Baird & Associates
Lynden Penner, J.D. Mollard and Associates

A hydroelectric power dam is being considered for Gull Lake in Northern Manitoba, which is a major tributary of Hudson's Bay. An assessment of recession rates for the young reservoir is a critical component of the environmental assessment. Consequently, a detailed erosion evaluation was required that considered the local geology and wind generated waves.

The proposed reservoir is 12 km along the east-west axis and 9 km in a north-south direction. Existing bathymetry and topography were utilized to create a 3D grid and define the spatial extent for the full supply level. The 3D grid was also used as input for a 2D wave model, STWAVE. The model was run for a 16 point compass and wind speed increments of 5 km/hr. To create hourly waves from the model simulations, a FORTRAN utility reads the hourly wind data, selects the most representative grid for each hourly condition, then exports a wave file with height, period and direction at the selected grid cell.

Rather than delivering the FORTRAN utility, the new ArcPublisher extension for ArcGIS 9.x was utilized to create a custom application for the client. Many spatial datasets were included in the Published Map, such as regional satellite coverage, orthophotographs, grids, contours, proposed structures for the dam, and a point file of the cell vertices for the modeling grid. ArcReader, which is a free software download, is used to view the Published Map and features much of the general functionality from the ArcGIS desktop. From ArcReader, the user zooms to a desired portion of the shoreline and the Hotlink button is used to select a grid cell, which then launches the FORTRAN utility. Collectively, ArcPublisher and ArcReader represent a power suite of visualization tools and a unique method of delivering the wave data, especially for non-GIS users.

Data Sharing II
Kensington D

C10. INTEROPERABILITY IN COASTAL ZONE MONITORING SYSTEMS: RESOLVING SEMANTIC HETEROGENEITIES THROUGH ONTOLOGY DRIVEN MIDDLEWARE
Surya S. Durbha and Roger L. King, GeoResources Institute, Mississippi State University

The nation's coastal and ocean resources are under increasing pressure from population growth and development. Many organizations are involved in collecting data to measure the primary properties of coastal zones using a variety of methods ranging from remote sensing to *in situ* sensors and sampling. The understanding of the complex interrelationships within a coastal zone necessitates the exploration of strategies for innovative acquisition, integration, and data exploitation technologies for fully interchangeable, timely, and accurate geospatial data analysis and mapping.

Sharing of the generated datasets, information, and results, between geographically distributed organizations often proves to be challenging. This is due to the complicated steps involved in

data discovery and conversion that result from the problems of syntactic, structural, and semantic heterogeneity in the datasets. The syntactic heterogeneity problems have been addressed to some extent by the standardization of metadata as advocated by multiple organizations. However, the lack of sufficient description of the meaning of the data along with a context may lead to the misinterpretation of data by users who are not involved in the original data acquisition process. Thus, semantic reconciliation is necessary to guarantee meaningful data sharing (i.e., the exchanged data is correctly interpreted and used).

Ontologies are widely recommended as a means of rectifying semantic heterogeneity. The advantage of using ontologies is that they can provide a conceptual schema regardless of a data set's format, structure, or size In this paper we propose an ontological framework for resolving semantic heterogeneity problems in coastal zone data. This type of framework will provide the capability to (a) link the users to the knowledge, making integrated visualizations available; (b) provide search and query answering facilities; and (c) gather information at different levels of granularity, from the subcategory to the specific data level.

C11. Withdrawn

C12. TERRAIN MODELING FOR DEVELOPING HYDROLOGIC RESPONSE UNITS FOR UNDULATING LANDSCAPES
Shivaji Prasad, Department of Geography, Frostburg State University

The accuracy of slope and aspect measures can influence the performance of any landscape models that use slope and aspect as their input parameters. Slope and aspect measures may vary considerably by the computing algorithms used. Consequently, the algorithms used for derivation of topographic data from DEMs can significantly influence the results obtained from landscape models particularly with those models which use slope and aspect for predicting performance of hydrologic surface run-offs, streams and estuaries water quality conditions on landscapes characterized by undulating topography particularly in coastal regions. Therefore, the objective of this study was to develop an algorithm suitable for estimating slopes and aspects for the landscape regions dominated by undulating topography.

Horn's algorithm is embedded under Spatial Analyst and 3-D Analyst of ArcGIS and ArcView, and is frequently used for computing slopes and aspects. In this study, slope and aspect analyses were performed using three algorithms: the Riter's algorithm, the Horn's algorithm, and a new Modeling Slope and Aspect of Undulating Terrain (MSAUT) algorithm developed during this study. The 7.5-minute USGS DEM data along with other data sets comprised of land-use and land cover, streams and roads, etc. were used for analyses. Data used in this study had been developed at a 30-m resolution within an image processing software ENVI and a grid-based GIS processing within ArcGIS.

North Branch Potomac region was used as test site for evaluating algorithms Results of slope and aspect analyses and their relative accuracies and efficiencies were presented. The results were quite interesting and the MSAUT algorithm seemed very promising.

Wednesday, March 9

EARLY MORNING SESSIONS
8:30 to 10:00 a.m.

Benthic Mapping: Techniques III
Kensington A

D01. HIGH-RESOLUTION GEOLOGIC MAPPING OF THE SEAFLOOR OFF MASSACHUSETTS
Seth Ackerman, Massachusetts Office of Coastal Zone Management, Woods Hole, MA
Bradford Butman, Jane Denny, William Danforth, and Brian Andrews, U.S. Geological Survey
James Crocker, NOAA Atlantic Hydrographic Branch

The Massachusetts Office of Coastal Zone Management (CZM), U.S. Geological Survey (USGS), and National Oceanic and Atmospheric Administration (NOAA) are conducting high-resolution mapping to characterize the surface and subsurface geology of the seafloor off Massachusetts. Mapping that utilizes existing NOAA, National Ocean Service (NOS) hydrographic data is presently focused in Boston Harbor, while other data-collection strategies are being employed in the South Essex Ocean Sanctuary (between Gloucester and Nahant), and the southern Merrimack Embayment (north of Cape Ann). The long-term objective is to develop high-resolution geologic maps defining the seafloor geology off coastal Massachusetts.

Interferometric-sonar, sidescan-sonar, and high-resolution seismic profiles were collected in the South Essex Sanctuary; multibeam bathymetry and backscatter were acquired within the Merrimack Embayment; and existing NOAA/NOS sidescan-sonar, single-beam and multibeam bathymetry, from 2000-2001, were utilized within Boston Harbor. The NOS surveys consist of 200% overlapping sidescan-sonar data, single-beam bathymetry and multibeam bathymetry and backscatter in the shipping channels and over targets identified by the sidescan-sonar.

The Boston Harbor sidescan-sonar data were processed and mosaicked at 1-m resolution, providing an excellent dataset for seafloor characterization, while the multibeam bathymetry is ideal for small-scale, target-specific mapping. These data provided the basis for collecting video, high-resolution digital photographs, and seafloor sediment samples in 2004. Integrating the sidescan-sonar imagery, multibeam bathymetry and sampling effort will yield a detailed view of the morphology and surficial sediment distribution of the seafloor. Future cooperation between CZM/USGS and NOAA's NOS will further the capability of using hydrographic survey data for interpreting seafloor geology.

D02. CHANGE IN NEARSHORE SUBSTRATES ALONG THE CENTRAL AND WESTERN BASIN SHORE OF LAKE ERIE
Donald E. Guy, Jr., and Jonathan A. Fuller, Ohio Department of Natural Resources, Division of Geological Survey, Lake Erie Geology Group
Christopher A. Zimmer, SECOR International
Dana M. Wilkinson, Wittenberg University

The U.S. Army Corps of Engineers and the ODNR Division of Shore Erosion mapped nearshore substrates using surface samples in 1876/77 and 1957/58, respectively. The ODNR Division of Geological Survey mapped substrates using side scan sonar and fathograms in the 1990s. These data sets were geographically referenced and compared to document long-term changes

in nearshore substrates along >270 km of shore. Mapping extends 1600 m offshore to the 12-m water depth in the central basin and 4700 m offshore to the 7-m water depth in the western basin. Sediments were grouped as rock, cohesive clay, sand, and mud. Area mapped and sediment classifications were limited by the area and sediment descriptions of the 1876/77 maps.

During the 190-year period covered by these data, there were significant changes in substrates, particularly along the Central Basin. During this same time period, the Ohio lakeshore underwent significant urbanization and modification. Temporal and spatial changes in substrates appear linked to disruption of the sediment budget by construction of harbors, dredging of channels, and armoring of the lakeshore.

D03. USING LANDSAT IMAGERY FOR COASTAL MONITORING AND MANAGEMENT
Aurélie C. Shapiro, Steven O. Rohmann, NOAA National Ocean Service

Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper (ETM+) imagery collected during a period from 1985 to 2004 have been acquired for Puerto Rico the U.S. Virgin Islands, in order to map shallow water marine habitats and study the dynamics of coral reefs over time. A recent analysis has involved employing several change detection methods to identify areas of pollution and hotspots of change in marine ecosystems, as well as locate areas vulnerable to repeated anthropogenic disturbance. Areas of local change due to pollution, sedimentation or natural influences were identified by comparing imagery pairs from different time periods. A multi-temporal classification technique, which aggregates similar pixels to classes, was used to discern areas of seagrass growth and loss were between 1985 and 2000 in eastern Puerto Rico. Image pairs were also analyzed using a Principle Components Analysis (PCA) to identify reefs subjected to repeated sedimentation and pollution in Saint Croix over yearly intervals. In collaboration with another project focusing on highly erosive areas and urbanization on land, we can now link land use change, and land-based sediment and pollution from adjacent watersheds to local changes in benthic environments. This analysis will aid local conservation planning by identifying target watersheds, as well as reefs areas for integrated management measures.

Coastal Mapping and Shoreline Change: Mapping Techniques
Kensington B

D04. HABITAT LOSS ANALYSIS OF A SEDGE ISLAND IN LITTLE EGG HARBOR, NEW JERSEY
Edward S. Gorleski and Keil A. Schmid, Hart Crowser, Inc.

A multi-source study using GIS, Remote Sensing, and surveyed shoreline data was undertaken on Mordecai Island to compare and highlight differences in their applicability for shoreline change analysis and future extrapolation. Mordecai Island's a 45-acre sedge island in Little Egg Harbor, New Jersey. Mordecai's western shoreline's subject to wave dominated processes resulting in high erosion and classic mud scarped geomorphology.

Advantages of extrapolating wetland shoreline locations have nationwide applicability and techniques are far less complex than those used in dynamic sand-dominated geomorphologies. In this case, the project helped a Community-Based Habitat Restoration project highlight erosion potential if immediate measures are taken.

Techniques for predicting future shoreline position include extrapolating historic shoreline change using manual measurements from wooden stakes, digitized orthorectified and georectified aerial photos, and readily available historic GIS shorelines. Erosion rates derived from multiple starting points (time) and data sources (type) were the main variables tested to ascertain accuracy and precision of the techniques for future prediction. Predictability was tested using the present shoreline as a baseline from which area estimates and shoreline position were analyzed. Prediction errors ranged from 2% to 40% for the baseline area comparison. However, comparisons over long time periods, regardless of the data source, and comparisons over short time periods using aerial photo data always yielded error estimates less than 8%. Shoreline orientation predictions based on erosion rates calculated from 13 year data yielded more accurate shorelines than 45 year old data. Based on this example, prediction of future trends for areas with similar wetland shoreline geomorphology should be achievable with high confidence.

D05. LEICA ADS40 SENSOR FOR COASTAL MULTISPECTRAL IMAGING
John C. Craig, 3001, Inc.

Multispectral remote sensing for coastal vegetation assessment is increasingly becoming an established and proven management tool. The ever increasing power of computer hardware and advances in image processing software make remote sensing more economical and accessible. Image acquisition has been limited, however, because of the relatively low resolution and small field of view of airborne multispectral sensors.

The Leica Geosystems ADS40 sensor collects imagery in 4 discrete multispectral bands (blue, 430-490nm; green, 535-585nm; red, 610-660nm and near infrared, 835-885nm) with 12-bit dynamic range, in a 12,000 pixel-wide swath, as well as panchromatic stereo imagery. This is several times the swath width of most airborne multispectral sensors, allowing large areas to be imaged more economically, and with better quality, due to the smaller number of flight lines required.

Among the ADS40 multispectral imaging projects that 3001 Inc. has completed is 12,400 square miles of Florida, including more than 300 miles of coastline, for the St. Johns River Water Management District. Imagery was delivered in true color (R,G,B) and color infrared (IR,R,G) GeoTIFF formats, as tonally balanced 8-bit imagery, and 16-bit imagery with linear characteristics suitable for remote sensing analysis. All these products were delivered in a fraction of the time required for previous mapping efforts.

Part of the imaged area (about 3000 square miles) was affected by three of the four hurricanes that struck Florida in 2004. The ADS40 was used to collect post-hurricane multispectral imagery of that area, providing two image sets of the same geographic area within the same year. This provides an excellent tool for change detection, resulting in a detailed assessment of damage to forests and conservation areas, as well as beaches, homes and properties.

D06. MAPPING SHORELINE ATTRIBUTES IN PUGET SOUND: A COMPARISON OF REMOTE SENSING PLATFORMS
Dana Woodruff and Lee Miller, Battelle, Pacific Northwest National Laboratory, Sequim, Washington
Roger Anderson, Battelle, Pacific Northwest National Laboratory, Seattle, Washington

In Washington State, the Puget Sound nearshore region is a highly productive ecosystem with over 2,500 miles of shoreline containing a diversity of beaches, mudflats, bluffs, saltmarshes, and wetlands. However Puget Sound is experiencing rapid growth and development with a steady loss of natural habitat, closures of shellfish beds, and a decline in the salmon fishery. Approximately one-third of the Puget Sound shoreline has been modified by human development. To address these concerns, the Puget Sound Nearshore Ecosystem Restoration Program (PSNERP) was formed in 2001. This is a large-scale, comprehensive initiative with the long term goal of protecting and restoring the natural processes and ecological functions of Puget Sound.

The use of remotely sensed imagery will play a significant role in assessing the Puget Sound shoreline. Baseline data is needed at a variety of spatial levels including landscape features (e.g. estuaries, river mouth deltas, exposed shorelines); shore form classifications (e.g. low bank, high bluff, rocky slope); habitat types (e.g. salt marsh, non-vegetated sand flats, eelgrass meadows); and shoreline modifications (e.g. armoring, piers, docks, pilings, ramps, outfalls). To address these needs, the Pacific Northwest Regional Collaboratory (PNWRC) is currently assessing and comparing the effectiveness of Landsat, IKONOS, Aster, and digital aerial imagery at discriminating the various nearshore features described above. Within a pilot area of Puget Sound, we are classifying remotely sensed imagery for shore forms, modifications, and habitat types from three spatial scales of imagery (i.e. 30-m, 4-15 m, sub-meter level). From this, we are developing a matrix-based decision support tool that will allow PSNERP to select the most appropriate, cost effective remote sensing platform(s) to address specific restoration questions.

Information Technology for Managers: Internet Mapping
Kensington C

D07. USING INTERNET MAPPING TOWARDS MORE EFFECTIVE COASTAL RESOURCE MANAGEMENT
Scott Lerberg, Virginia Coastal Program, Department of Environmental Quality

Since 1986, Virginia's Coastal Program (VCP) has linked state, local, and federal efforts to create more sustainable coastal communities and ecosystems. NOAA's recent evaluation highlighted many of the program's accomplishments including; a) concentrating coastal management efforts and funds into long-term projects which support long-term restoration and management strategies, and b) improving coordination efforts among state agencies and local governments with coastal resource priorities. This presentation presents two case studies on how we employ GIS technology towards effective coastal resource management efforts.

Initiated in 2002, the *Virginia Seaside Heritage Program* is a public-private partnership, funded by the (VCP) to address management of the aquatic resources along Virginia's Eastern Shore. Through a partnership of state agencies, local governments, academia, non-profits, and private businesses, this project hopes to restore sustainable ecological and economic vitality to an area that was devastated by hurricanes, over-harvesting, and eelgrass diseases in the 1930s. One current accomplishment of this project has been the development of an internet based comprehensive geographic inventory that will form the basis for a long-term management strategy. An overview of the Seaside Heritage Program ArcIMS website will be presented.

The Coastal Program's *Blue-Green Infrastructure Mapping Project,* which feeds into VCP's Integration Strategy, was designed to create policies that link local land use plans to state water use policies. The Integration Strategy was proposed to coordinate efforts among agencies and between levels of government. The availability of coastal resource data is essential to improving

the decision making process. The VCP is currently developing an ArcIMS site that would result in a web-accessible inventory for the best remaining blue and green infrastructure. This project's methodology, current progress, and future goals will be discussed.

D08. ECOGIS – GIS TOOLS SUPPORTING ECOSYSTEM APPROACHES TO MANAGEMENT
Ken Buja and David Moe Nelson, NOAA National Centers for Coastal Ocean Science, Center for Coastal Monitoring and Assessment, Biogeography Program
Tim Haverland, NOAA Fisheries, Office of Science and Technology

NOAA has launched a project to develop GIS approaches for managing and researching marine fishery ecosystems for the East Coast and Gulf of Mexico Fishery Management Councils. Ecosystem approaches to fisheries management require information that allows evaluation of interactions between species, fisheries and habitats. The key questions involve bycatch and aspects of competition between fisheries, indirect effects of harvesting, and interactions between the biological components and the physical attributes of the ecosystem. Because many of these effects occur simultaneously and vary spatially, understanding their consequences for management is difficult. Developing a GIS tool for visualizing multiple data sets and for analyzing their consequences represents a logical approach for both scientific investigations of interaction effects and as a tool for use by managers to examine data and to pose questions.

This project, a team effort of the National Marine Fisheries Service and National Ocean Service, will develop two types of GIS decision support tools—a management level application geared to simple data visualization and summaries, and a scientific assessment tool to support ecosystem modeling. To launch the project, NOAA hosted a workshop to demonstrate the application of GIS to ecosystem based fisheries management, describe the needs of fisheries management and science, and explore available data and modeling capabilities. The project team will set priorities based on the guidance provided by the results of workshop. In the coming year, the team will compile data on marine and estuarine habitats, fishery-dependent and independent surveys, and managerial boundaries to incorporate into ArcGIS. Data will be analyzed and presented, and analytical models developed. Finally, the team will complete an interim report, and extend capabilities to users.

D09. DEVELOPING A DYNAMIC AND DISTRIBUTED GIS TO SUPPORT COASTAL MANAGEMENT ALONG THE LAKE SUPERIOR COAST OF WISCONSIN
David Hart, University of Wisconsin Sea Grant Institute
Mark Miller, Cadastra, Inc.
Carola Blasquez, Jennifer Zeisloft, and Stephen Ventura, University of Wisconsin-Madison

The Lake Superior coast is still rugged and undeveloped compared to the other Great Lakes, but the rapid pace of development challenges coastal managers seeking to promote sustainable development and protection of natural resources. Jurisdiction over the protection and management of Lake Superior coastal resources in Wisconsin is distributed among many agencies at various levels of government and communication, and information sharing among these agencies is critical to effective coastal management. Recent breakthroughs in technology allow the development of integrated and interoperable geographic information systems (GIS) that hold great promise to improve multi-jurisdictional coastal resource management.

This presentation discusses a three phase project funded by the NOAA Coastal Services Center to develop a "dynamic and distributed GIS" to support integrated coastal management along the Lake Superior coast of Wisconsin. A dynamic and distributed GIS is one where custodians, whether they be local, regional, state, federal, academic, or non-profit, maintain and provide

access to the most current spatial data and multiple remote users can access and integrate data in real-time from multiple sources. The first phase involves the development of web mapping interfaces and tools to support public access to local government GIS data. It extends a prototype developed for Bayfield County to other local and regional government organizations along the Lake Superior coast. The second phase concerns the implementation of web mapping services that allow integration of disparate GIS data across political boundaries. Rather than developing stand-alone local government web mapping sites, the project draws upon the principles and protocols of the Open Geospatial Consortium to link local web mapping services and build an interoperable, "bottom-up" coastal GIS. Finally, the third phase builds upon a successful coastal GIS training program developed by University of Wisconsin Sea Grant Institute and the Land Information and Computer Graphics Facility (LICGF) at the University of Wisconsin-Madison to teach local government professional staff, citizens, and other coastal constituents how to use these integrated web mapping services through workshops and web-based tutorials. This paper/presentation will focus on the issues associated with the implementation of web mapping services in rural local governments and the technical and institutional concerns of integrating interoperable web mapping services to address coastal hazards and smart growth planning along Lake Superior in Wisconsin.

Land Use and Community Planning: Water Quality Tools
Kensington D

D10. PROTECTING WATER QUALITY USING A NATURAL RESOURCE-BASED PRIORITY PARCEL PROCESS

Kevin L. Cronk, Monitoring and Research Coordinator, Tip of the Mitt Watershed Council

Watershed management plans commonly include land conservation as a recommended action for reducing nonpoint source pollution and protecting water quality. Typically, land protection efforts are carried out by conservancies and local governments through land acquisition, voluntary conservation easements, master planning and zoning. Organizations involved in land conservation have ever greater access to natural resource inventories and are able to use this information to help guide decisions. Although natural resource inventories are valuable for making generalizations regarding the environmental value of a particular parcel, they do not provide the quantitative values necessary for a ranking system. During the development of watershed management plans in the northern Lower Peninsula of Michigan, criteria established by advisory committee members were used by Tip of the Mitt Watershed Council staff to develop a 'priority parcels procedure' using a GIS that quantifies the environmental value of all parcels in the watershed. Criteria for the procedure include: 1) total acreage, 2) groundwater recharge acreage, 3) wetland acreage, 4) lake shoreline distance, 5) stream shoreline distance, 6) adjacency to protected lands, and 7) habitat or occurrence of threatened/endangered species. Determination of specific environmental values for particular parcels provides a tool that conservancies and local governments can use for site-by-site decisions, inter-parcel comparisons, master planning, zoning development and modifications, and discerning ecological patterns such as wildlife corridors. Permanent protection of high priority parcels will help maintain the ecological integrity of the most sensitive areas and ultimately protect and enhance water quality of the region.

D11. THE NONPOINT-SOURCE POLLUTION AND EROSION COMPARISON TOOL

Dave Eslinger, NOAA Coastal Services Center
Margaret VanderWilt and Ed Dempsey, I.M. Systems Group at the NOAA Coastal Services Center
Jamie Carter and Bev Wilson, Perot Systems Government Services at the NOAA Coastal Services Center

The NOAA Coastal Services Center has developed the Nonpoint-Source Pollution and Erosion Comparison Tool (N-SPECT) to examine the relationships between land cover, soil characteristics, topography, and precipitation in order to assess spatial and temporal patterns of surface water runoff, nonpoint-source pollution, and erosion. N-SPECT is a GIS tool implemented in Environmental Systems Research Institute's ArcMap™ software package, and requires the Spatial Analyst™ extension. Land cover, topography, soils, and precipitation data sets are used to estimate rainfall runoff volume as well as suspended sediment concentrations and total loads at both the local (pixel) and watershed scales. Coefficients representing the contribution of each land cover class to observed pollutant concentrations are applied to land cover data sets to approximate pollutant loads and concentrations. These coefficients were derived from published studies and local water quality sampling data. For each pollutant analyzed, water quality ratings are assigned spatially by comparing pollutant concentrations calculated by N-SPECT to user-defined water quality standards. Knowledge of the distribution of areas demonstrating sub-standard water quality can help resource managers and planners target areas needing better management practices. N-SPECT also provides functionality to compare current land cover conditions to theoretical changes in both land use and land cover. The results of N-SPECT analyses are intended to be used as screening tools to help understand and predict the impacts of management decisions on water quality and, potentially, on nearshore coral health.

D12. DEVELOPING A WATERSHED NUTRIENT MANAGEMENT TOOL FOR EVALUATING AGRICULTURAL BMPS FOR REDUCING NUTRIENT LOADING IN COASTAL WATERSHEDS

William Salas, Applied GeoSolutions, LLC
Changsheng Li, Complex Systems Research Center, University of New Hampshire

Nutrient enrichment in estuaries and coastal ecosystems across the US is primarily a result of non-point source pollution from urban and agricultural land use. Site specific management strategies for stabilizing, or even improving, eutrophic conditions are needed. Managers need to be capable of evaluating the influence of various land use practices on nutrient loading at the field and watershed scales to enhance the protection and preservation of coastal systems. These decision-makers need to be empowered with tools that capture the unique characteristics of their region, processes that control the input and fate of nutrients, and utilize geospatial technologies to provide spatially explicit and scientifically sound information.

Funded by The Cooperative Institute for Coastal and Estuarine Environmental Technology, an existing process-based soil biogeochemical model, called Denitrification-Decomposition or DNDC, has been modified to develop a geospatial decision support tool for assessing the effectiveness of agricultural management options for reducing nutrient loading to the Elkhorn Slough NERR. Understanding how the biophysical characteristics (soil properties, climate) and farming practices impact the fate of nitrogen enables mangers to assess alternative management strategies across their watershed in a spatially explicit manner. The project has worked closely with the local managers/researchers to define management options and to train a constituency of users in using this decision support tool. The project created a GIS tool for decision-makers to quantify the important factors that influence N-cycling in the watershed and how those factors impact the fate of nitrogen and watershed level NPS loading. Buoyed by the success of the Elkhorn Slough Project, efforts are underway to implement this decision support tool in the Delaware and Old Women Creek watersheds in the NOAA NERR system. This Watershed Nutrient Management – DNDC tool will be presented.

BREAK
10:00 to 10:30 a.m.

LATE MORNING SESSIONS
10:30 a.m. to 12:00 p.m.

Habitat Restoration: Planning
Kensington A

E01. USING INTERPOLATED HIGH FREQUENCY SPATIAL DATA TO MONITOR WATER QUALITY CONDITIONS FOR SAV GROWTH IN CHESAPEAKE BAY

David J. Wilcox, Kenneth A. Moore, Britt A. Anderson, and Robert J. Orth, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary

The impacts of excess nutrient and sediment inputs on submerged aquatic vegetation (SAV) in Chesapeake Bay are largely related to their effects on reduced light availability for SAV growth. Attainment of specific water clarity criteria related to SAV designated use of shallow waters has therefore become an important component of water management in the Bay. In the Chesapeake Bay the historical distributions of SAV have been used to define shallow water designated use boundaries, the applications depths to which water clarity criteria (22% of surface irradiance) are applied within these boundaries, and the area goals for SAV restoration or recovery. Measurement of the attainment, or lack thereof, of these specific water clarity criteria in SAV designated use areas has required the development and application of high frequency spatial and temporal monitoring of these areas using fixed stations, as well as flow-through monitoring systems placed on small vessels.

Water clarity data from the flow-through monitoring systems is collected and integrated with a GPS to produce a GIS point layer along the boat track. The GIS point layer is then interpolated using ordinary kriging to generate a grid data layer for each sampling date. Bathymetry, historical SAV, and monitoring segment layers are applied to the resulting grids to produce a cumulative frequency diagram combining all dates for the segment being monitored. This diagram is compared to a reference diagram to assess attainment of water clarity criteria within the shallow water designated use boundaries of the segment.

E02. USING WINSLOW'S 1886 PAMLICO SOUND OYSTER BED SURVEY AND GIS TO GUIDE FUTURE RESTORATION PROJECTS

Eugene S. Ballance, Qualk Hammock Ltd.
Barry Cullens, Bottom Image Sidescan Sonar Mapping
Jeffrey Smith Deblieu, The Nature Conservancy

The Winslow oyster bed survey of North Carolina in 1886 was investigated with GIS and sidescan sonar. Assuming that a place where continuous beds existed in the past, has nearby spawning stock, and that also is environmentally similar, would be a good place to try to restore.

This project focused on all the Pamlico Sound portion of the survey, except Rose Bay and Pamlico County. It included information from five sources: the Winslow report to the NC Shellfish Commission, ten charts of the survey produced of bed and lease boundaries, a 1:80,000 map produced by NC Department of Agriculture in the early 20th century, books of private leases granted by the survey in the years following, and positions of clutch plantings in the area since the 1970's.

Line shapefiles were traced on scans of the projections. Then, using an avenue script based on a local affine transformation, and global shifts based on surviving control points, the resulting projected shapefile was used to develop polygons to calculate areas and compare with the values in the Winslow report. Lines calculated from the lease measurements and sextant observations were compared with the projected lines. Recent clutch planting position data was projected from loran TDs to geographic latitude and longitude in cases where necessary.

The top 27 beds, in terms of solid coverage, were then field investigated using sampling devices and sonar, to determine mean lengths of any live oysters. Live samples taken were shown to be far removed from clutch planted areas. Areas with high restoration potential were listed.

E03. MAPPING PREDICTED TIDAL EXPOSURE DURATIONS USING A LIDAR BASED MLLW-REFERENCED TERRAIN MODEL FOR INVASIVE *SPARTINA ALTERNIFLORA* TREATMENT AND CONTROL IN WILLAPA BAY

T.Z. Alcock, K. Bennett, and M. Wecker, University of Washington Olympic Natural Resources Center

Olympic Natural Resources Center GIS is producing maps showing predicted tidal exposure durations for resource managers and stakeholders to plan herbicide applications to control *Spartina alterniflora* in Willapa Bay. The efficacy of the two primary herbicides used drops dramatically when treatment area drying time durations fall below a certain level. We have been using a LIDAR based Mean Lower Lowest Water (MLLW) referenced elevation model and NOAA National Ocean Service (NOS) tide predictions to provide these spatially explicit tidal exposure duration maps. Validation and accuracy assessments are underway. One challenge we overcame is that the MLLW datum itself, which is used by all tide stations for which predictions are published by the NOS, varies from point to point in the bay. Another is the fact that features within the bay exert their own dynamic hydrologic effects on all aspects of tide mechanics. This complexity makes correlation with NOS tide predictions, which are typically open-water data, very difficult. Our approach to these challenges has been to obtain GPS points along the water line to detect the intersection between the water surface and the underlying terrain to detect quantifiable errors. Using this error data, we have refined the MLLW-referenced elevation model that is the basis of our mapping methodology. When properly validated, these tidal exposure duration maps can be far superior to the use of tide tables alone. They provide a useful and elegant decision support tool to economically and effectively incorporate chemical applications into Integrated Pest Management strategies.

Coastal Mapping and Shoreline Change: Land Cover
Kensington B

E04. PREDICTING FUTURE SHORELINE CONDITION BASED ON LAND USE CHANGE AND INCREASED RISK ASSOCIATED WITH CLIMATE CHANGE

Lynne M. Dingerson and Carlton H. Hershner, Virginia Institute of Marine Science

Marshland and riparian buffer are facing an increased risk of degradation in the face of land use conversion and climate change. Change in land use can bring about changes in shoreline condition, and by examining these relationships, a more realistic model of future shoreline condition can be developed. The project was conducted in Guinea Neck, Virginia, an area characterized by very low relief, mixed land uses, and a sizable rural population. Historical imagery was used to build a prediction model to evaluate future land use conversion. Image sets spanning 65 years

were digitized, classified for land use and classified for proximity to features that would make development more appealing (water, roads, schools, etc.). The prediction of future land use was based on the historical rate and proportion of conversion from one land use to another. Sea level rise resulting from climate change was estimated for the low-lying study area and incorporated into the model. Correlations between land use and shoreline condition were then used to build a fuzzy logic framework to predict the impact of land use change on condition of the shoreline. The model is intended to aid coastal managers and decision-makers in assessing likely changes to coastal resources over time. This information can be used to encourage appropriate incentives and regulations to guide shoreline development and preservation. As part of the analyses, various management strategies have been examined to determine their effects on future shoreline condition.

E05. THE COASTAL CHANGE ANALYSIS PROGRAM (C-CAP): THE PAST, PRESENT, AND FUTURE OF LAND COVER MAPPING IN THE COASTAL ZONE
Nate Herold, NOAA Coastal Services Center
Shan Burkhalter, Perot Systems Government Services at the NOAA Coastal Services Center
Chris Robinson, I.M. Systems Group at the NOAA Coastal Services Center

The National Oceanic and Atmospheric Administration's Coastal Services Center has been developing land cover and change data, at a 30 meter resolution, for the coastal zone of the U.S. as part of its Coastal-Change Analysis Program (C-CAP). This effort is being conducted in coordination with state coastal management agencies, the U.S. Geological Survey (USGS), the Multi-Resolution Land Characteristics (MRLC) consortium and other federal programs. C-CAP data are directly incorporated into the latest version of the national land cover database (NLCD), and the National Map. An immediate objective for C-CAP is to expeditiously complete a national baseline, to which additional dates of imagery will be used to track coastal changes through time. This trend information will aid in understanding the effects of previous management practices and could be used in forecasting future change, or in predicting the impacts due to change, helping coastal resource managers make more informed regional decisions. This presentation will review the history, status, and future direction of C-CAP in its vision as being a source of current, highly accurate, highly useful information in the coastal zone. Several regional specific examples will be highlighted.

E06. HIGH RESOLUTION COASTAL LAND COVER FOR LOCAL RESOURCE MANAGEMENT
Chris Robinson, I.M. Systems Group at the NOAA Coastal Services Center
Nate Herold, NOAA Coastal Services Center

NOAA's Coastal Services Center is currently developing land cover and change data, based on Landsat imagery, for the coastal zone of the U.S. as part of its Coastal Change Analysis Program (C-CAP). Regional C-CAP data are being directly incorporated into the National Land Cover Database (NLCD) and the National Map. With the future of the Landsat satellites uncertain, and the increasing commercial availability of high spatial resolution imagery, NOAA is looking to the private sector for assistance in creating a framework for high resolution land cover development that is consistent with the overall vision of C-CAP as a source of current, highly accurate, highly useful information in the coastal zone. CSC is currently conducting a number of prototype demonstrations, based upon several high resolution image sources and state of the art processing techniques, which will be used to determine the approach that best provides coastal resource managers with site specific land cover information for decision support. The demonstration's geographic focus will be in the Florida Panhandle region and will rely on coordination with state and local governments.

The primary objectives of this demonstration include producing land cover data intended for local site specific applications, as well as building upon the information contained within the 30 meter baseline product.

Data Sharing III
Kensington C

E07. ADVANCEMENT OF A COASTAL ENTERPRISE GIS
Kathy Fitzpatrick Martin County Engineering Department
Echo Gates, Florida Department of Environmental Protection
Robert Hudson, GIS Solutions

Martin County is located on the central Atlantic coast of Florida. With no major industries the County relies heavily on marine related interests to fuel its economy—a fact made evident by the County seal which proclaims Martin County "The Sailfish Capital of the World." The Martin County Engineering Department administers the County's Coastal Program which includes: 1) Artificial Reef Construction and Management; 2) Habitat Management; 3) Beach Maintenance; and 4) Inlet Maintenance and Management.

The growing number of issues governing coastal projects has resulted in an increase in both the number and specificity of these grants and permits. As a result, managing Coastal Program information is becoming increasingly complex. Each program represents an ongoing long-term commitment from the County and a substantial financial investment in the planning, permitting, construction and monitoring phases the projects in each program. Multiple grants and permits are associated with the different projects in each program. Each grant and permit contains specific conditions and monitoring requirements associated with each project, permit or grant phase. The complexity of the management issues prompted the coastal division to consider the development of a GIS based coastal information management system to address these concerns.

The goal of the Coastal GIS project is to facilitate the integration of the financial, planning, operational, and monitoring project information, and to improve data dissemination capabilities to the public, scientific, engineering, and regulatory communities. The County is focusing its resources on building a sustainable, standardized, and documented Coastal GIS that meets the needs of Martin County while contributing and conforming to the evolving state and national coastal geo-spatial initiatives. The Marine Data Model, among other initiatives, is the point of departure from which Martin County is designing, building, and integrating GIS data into its Coastal GIS.

E08. GIS AND MOBILITY SUPPORT FOR NEW JERSEY WATERSHED VOLUNTEER MONITORING NETWORK
Nabil R. Adam and Vijay Atluri, Rutgers University
Soon Ae Chun, Rutgers University and Seton Hall University

New Jersey's Water Quality Monitoring and Standards Program is intended to enhance water quality by vigilant toxic monitoring in streams, rivers and lakes and by improving storm water management through the bacterial source track down program for detecting bacteria from sewage spills and non-point sources. The water monitoring activities are augmented by volunteers from the Watershed Watch Network.

The volunteer monitoring possess the following unique characteristics as opposed to stationary monitoring stations: (i) The sampling locations are not fixed; they are ad-hoc and change from time to time. (ii) The location specific data may be available but not accessible at the time of sampling, prohibiting volunteers from detecting abnormal quality values deviant from location specific trends or expected values. (iii) The sample data will be delayed and error prone if submitted manually using a personal computer. (iv) Volunteers are from diverse groups, including school children.

This paper presents a Web-based user-friendly mobile and spatial prototype system to support the volunteer monitoring activities. A GPS equipped mobile device with map-based interface allows volunteers (1) to enter and retrieve the sample data on-site via wireless communication; (2) to obtain location of monitoring sites within a watershed, water bodies, population density, and measured parameters around the location of choice, as well as hotlinks to state and federal information; (3) to create the historical and aggregate view of the water quality data captured at a location to assess the seasonal trends and to identify an appropriate sampling location; (4) to view the statistical data such as population, zoning designation, and local water bodies to aid the general assessment of water quality; and (5) to utilize the quality assurance related multimedia tutorials readily available for guiding through steps for onsite data sampling.

E09. SEABIRD ECOLOGICAL ASSESSMENT NETWORK MAPPING APPLICATION (SEANET MAP): DATA DISTRIBUTION AND INTERNET MAPPING FOR MARINE ECOSYSTEM HEALTH

Beth Suedmeyer, Tufts Center for Conservation Medicine
Ed Dempsey, I.M. Systems Group at the NOAA Coastal Services Center
Becky Harris, Tufts Center for Conservation Medicine

Focusing on seabirds as indicators of marine and coastal ecological health, Tufts Center for Conservation Medicine is developing a network of seabird researchers from Canada to New Jersey, launching “citizen-scientist” beached bird surveys, and collecting data on seabird mortality, population distribution, ocean contamination, and coastal land use. In collaboration with the Massachusetts Office of Coastal Zone Management, NOAA Coastal Services Center, US Environmental Protection Agency, and USGS National Biological Information Infrastructure (NBII), we are collecting primary data and mining for other seabird-related data which will be integrated into an Internet mapping application, SEANET MAP. An associated beached bird data entry application is being created at the Wildlife Disease Information Node of NBII, which will ensure standardization of beached bird and mortality data and facilitate data entry. The data distribution and mapping application will allow us to encourage the sharing of more data and implement an outreach and public education program to inform the larger community about SEANET MAP and the issues involving seabird conservation and marine and coastal ecological health.

Marine Protected Areas
Kensington D

E10. UTILIZATION OF MARXAN AS A MARINE CONSERVATION ASSESSMENT TOOL IN THE SOUTHEASTERN US

Katherine Eschelbach and Patrick Halpin, Nicholas School of the Environment and Earth Sciences, Duke University

Balancing the need for comprehensive data and expediency is a major challenge in conservation planning. It is impractical to attempt to protect all of the habitats within a planning region due to the limited resources and time frames planners face. Ecoregional conservation assessments

provide information to planners concerning which areas on a broad scale should be prioritized for protection. The spatially driven decision-making tools used in the conservation assessment process can provide powerful information on both biological diversity and socioeconomic threats to guide planning and protection efforts.

The Marine Initiative of The Nature Conservancy is in the process of completing marine conservation assessments nationwide to guide their protection strategies. The decision-making tool used in many of the Conservancy’s marine ecoregional assessments is a modeling program called MARXAN, a spatially explicit simulated annealing algorithm. MARXAN provides an optimized marine reserve network based on inputs to the model, which include information on fine and coarse filter targets, costs to target viability, and managed areas. The resulting network can be further refined based on expert knowledge of scientists, managers, and planners that work within the region. The Duke Geospatial Analysis Program has been partnering with the Marine Initiative in its efforts to complete ecoregional assessments in the South and Central Florida and Mid and South Atlantic Ecoregions. The results of the model for these two ecoregions will be discussed along with the challenges and alternatives to using MARXAN as an assessment tool.

E11. DEVELOPMENT OF A SPATIAL ANALYSIS TOOL TO ASSESS VESSEL SPEED ZONES TO PROTECT CETACEANS

Benjamin Cowie-Haskell and David Wiley, NOAA Stellwagen Bank National Marine Sanctuary
Kimberly Cohen and Ed Dempsey I.M. Systems Group at the NOAA Coastal Services Center
Hamilton Smillie, NOAA Coastal Services Center

The Stellwagen Bank National Marine Sanctuary has a mandate to protect natural resources including cetaceans. The sanctuary serves as a critical feeding ground for numerous cetaceans, several of which are endangered. The sanctuary is also a heavily used area for fishing, boating, marine transportation, and whale watching. These activities have lead to increased impacts on cetaceans. The sanctuary is addressing this problem, and others, through a revision of its management plan. To assist the sanctuary and involved stakeholders in developing solutions to the problem, a spatial analysis tool was developed. The objective of this tool was to (1) assist stakeholders in the development of a speed zoning scheme in the sanctuary that reduces risk of shipstrikes to cetaceans while at the same time minimizing negative economic impacts to users, and (2) understand the costs to users of alternative speed zone scenarios. The analytical basis for the tool will be discussed and a demonstration of its functionality provided. The tool is suitable for use in other geographic areas facing similar problems.

E12. ANALYSIS OF SPATIAL AND SOCIOECONOMIC BASELINE INFORMATION AND FISHING PROFILES IN SUPPORT OF THE JOINT MANAGEMENT PLAN REVIEW (JMPR) PROCESS: AN APPLICATION OF THE OCEAN COMMUNITIES 3E ANALYSIS (OCEAN) TOOLS

Charles Steinback and Astrid J. Scholz, Ecotrust

Ecotrust was contracted by the three central California National Marine Sanctuaries—Cordell Bank National Marine Sanctuary, Gulf of the Farallones National Marine Sanctuary, and Monterey Bay National Marine Sanctuaries—to collect, compile and analyze spatially explicit socioeconomic information pertaining to commercial and recreational fisheries in and around sanctuary waters. We present methods and results based upon analytical and informational needs identified by two stakeholder-working groups, which was conducted in support of the Joint Management Plan Review process. Analysis was conducted using Ecotrust’s Ocean Communities “3E” (economy, ecology, and equity) Analytical (OCEAN) suite of tools. The OCEAN framework utilizes a GIS

database for spatial analysis and interpretation of a wide range of ecological and socioeconomic data, coupled with an interface that allows scientists, managers, and communities to take an integrated and systemic look at ecosystems, fishery policy and marine conservation issues, as well as the effects of policy changes on central California coastal communities.

The data sources used for this project were both quantitative, including fishery dependent and independent data, and qualitative, relying on fishermen's knowledge and direction. Most significantly, the project relied on a participatory process for eliciting local fishermen's knowledge of critical economic areas for each fishery. This information was captured spatially and then used to constrain agency data sources. Specifically, we used the local characterizations of the fishing grounds to interpolate the fishery dependent data sets, and to derive use patterns and fishing effort on the grounds. Summarizing this information to the port level, we constructed detailed socioeconomic profiles of communities adjacent to the sanctuaries and of fleet sectors whose livelihoods rely upon the sanctuaries areas. Future applications of the products from this project likely include decision-support for the consideration of marine protected area siting and other management issues in central California and beyond.

PLENARY LUNCH
12:00 to 2:30 p.m.
Kensington Ballroom

Dr. Richard Spinrad, Assistant Administrator, National Ocean Service

Prior to joining NOAA, Dr. Spinrad held a wide range of positions in government, academia, private industry, and nongovernmental organizations, encompassing broad experiences in marine science, technology, operations, and policy. A native of New York City, he obtained his undergraduate degree from Johns Hopkins University, as well as an M.S. in physical oceanography and a Ph.D. in marine geology from Oregon State University.

NOAA's National Ocean Service is dedicated to exploring, understanding, conserving, and restoring the nation's coasts and oceans. It balances environmental protection with economic prosperity in fulfilling its mission of promoting safe navigation, supporting coastal communities, sustaining coastal habitats, and mitigating coastal hazards.

AFTERNOON SESSIONS
2:30 to 4:00 p.m.

Remote Sensing Applications: Coasts and Oceans
Kensington A

F01. COMPARING IN-SITU DATALOGGER SEA TEMPERATURE DATA WITH AVHRR SATELLITE DERIVED SEA SURFACE TEMPERATURE DATA IN VATIA BAY, AMERICAN SAMOA
Francesca Riolo, Department of Marine and Wildlife Resources
Kenneth S. Casey, NOAA National Oceanographic Data Center

The aim of this study is to provide a combined satellite and in situ dataset to assess the capability of the AVHRR Pathfinder data to accurately monitor water temperature on coral reefs in coastal areas

around American Samoa and to fill temporal and spatial data gap of available in situ measurements. By-hourly in-situ data (available from 1999 to present) were compared with overlapping ascending and descending pass Pathfinder Version 5.0 sea surface temperature data for a neighborhood of pixels around the location of the in-situ logger in Vatia Bay at daily, weekly and monthly time scales. The statistical analysis shows a promising correlation and biases between the in-situ logger data and the AVHRR derived SST. It can be concluded that, with the adequate precautions, satellite data can be meaningfully used to retrieve information on the thermal status of coastal waters and thus of reef systems when in-situ data are missing. These results are being used to support the use of 4x4km Pathfinder data for an automatic monitoring alert system to detect potential bleaching conditions in coastal areas of American Samoa on a weekly basis.

F02. INTEGRATED AIRBORNE BATHYMETRIC LIDAR AND MULTIBEAM ECHOSOUNDER COASTAL ZONE MAPPING IN ALASKA AND CALIFORNIA
Jerry C Wilson, Fugro Pelagos, Inc.

Seafloor mapping of regions of Alaska and California was successfully and economically completed using integrated Airborne LIDAR Bathymetry (ALB) and shipboard multibeam echosounding (MBES) operations. These methods also yielded additional information resulting in data fusion of airborne and acoustic imagery co-registered with the high-resolution terrain mapping.

The main objective for the Alaska surveying was nautical charting for navigation safety in an intricate area of islands and drying reefs; for California it was to support planning for beach replenishment projects. The augmentations to seafloor mapping included acoustic and multispectral imagery, and geo-referenced digital ortho-photos. The ALB system used is the SHOALS-1000T, which further incorporates onshore LIDAR topographic mapping capability.

The Alaska surveying covered a complex area of 87km^2 in the Sitka region, and represents NOAA's first simultaneous deployment of these systems. Navigation safety and scientific information for this area are significantly enhanced by the high-resolution 100% coverage of MBES plus ALB data over the shoal zones surrounding the numerous islets. An integral part of the ALB data acquisition is georeferenced digital imagery as part of quality control for data processing. Additionally, these are easily mosaicked to result in an aerial image of the shorelines, islands and sea surface.

The California mapping covered 135km of shoreline northward from the Mexican Border. It includes data for an integrated back-beach, intertidal and offshore DTM, seafloor habitat mapping using acoustic imagery plus multispectral imagery in the shallow zones. The integrated data set was delivered in GIS format with FGDC metadata, and is available to the public on the web.

This presentation will also describe additional ALB and MBES data products under development.

F03. REMOTELY SENSED PRECIPITATION DATA AND DIGITAL FORECASTING PRODUCTS FOR FECAL COLIFORM MODELING IN SHELLFISH HARVEST AREAS
R. Heath Kelsey, Baruch Institute for Marine and Coastal Sciences, University of South Carolina
Geoffrey I. Scott, Center for Environmental Health and Biomolecular Research, NOAA National Ocean Service
Dwayne E. Porter, Baruch Institute for Marine and Coastal Sciences and the Arnold School of Public Health, University of South Carolina

Closure of some South Carolina shellfish harvesting areas is controlled by empirical relationships between precipitation recorded at weather stations and fecal coliform densities in the shellfish harvest area surface waters. Resource managers in South Carolina close conditionally approved harvest areas after rainfall events that will likely result in public health hazard, which is indicated by fecal coliform levels above established water quality standards.

The location of weather stations and the spatial variability of rainfall may result in discrepancies between rainfall recorded at weather stations and actual precipitation in the harvest areas. A pilot project was established to evaluate the potential for prediction of fecal coliform densities and shellfish harvest area closure using precipitation estimates derived from forecast data and remotely sensed rainfall data products available from the National Oceanographic and Atmospheric Administration.

These data are used to develop an empirical relationship between precipitation and fecal coliform bacterial densities that require closure of conditionally approved shellfish harvest areas. Data are also used to develop a probability-based model for closures based on precipitation forecast data and the associated probability that a threshold rainfall event will occur. Issues relating to data access, data management, and data accuracy and bias removal are discussed. Additionally, issues related to model development, validation, and utility of model output are also considered.

Ocean Observing Systems for Coastal Managers
Kensington B

F04. GENERATING STORM SURGE INFORMATION PRODUCTS FOR EMERGENCY MANAGERS IN SOUTH CAROLINA

Jeremy Cothran and Braxton Davis, University of South Carolina

The Coastal and Estuarine Modeling and Environmental Prediction System (CEMEPS) storm surge model, in development at North Carolina State University, is a cornerstone product of the new Carolinas Coastal Ocean Observing System (Caro-COOPS). The model will provide updated storm surge projections based on near real-time Caro-COOPS observations of meteorological and ocean conditions offshore of SC, using the latest hurricane track forecasts issued by the National Hurricane Center. As a hurricane approaches, NC State modelers provide storm surge data to the Caro-COOPS data management group (at the Baruch Institute for Marine and Coastal Sciences at the University of South Carolina), who transform the data into information products for the SC Emergency Management Division. The ongoing development of information products and communication protocols between these organizations serves as a test case for providing storm surge information to additional user groups.

Raw data from the storm surge model is converted to netCDF file format and ArcGrid format, which allows it to be displayed through an ArcIMS GIS browser service alongside real-time observations from the Caro-COOPS observing array. Model output is also used to populate a relational database, which, in conjunction with image creation utilities from MapServer GIS, can be used to create a set of time-indexed images corresponding to projected storm surge levels. These images are then converted to an animated gif file (time indexed to match the time on each GIS layer). Images are also converted to a pdf format for downloading, printing, and dissemination via email. GIS data layers in this application are also Web Mapping Service-enabled, which allows users to pull individual data layers into their own GIS or application.

F05. SPATIAL ANALYSIS OF CHESAPEAKE BAY WATER QUALITY DATA

Mark Trice and Bruce Michael, Maryland Department of Natural Resources

Maryland DNR, in conjunction with the NOAA and EPA Chesapeake Bay Program Offices and other partners, has developed an intensive network of temporally intensive continuous monitoring sites and spatially intensive water quality mapping zones to characterize water quality criteria for the Chesapeake Bay's living resources. In 2004, continuous monitors at 34 sites in Maryland measured ambient water quality parameters, including dissolved oxygen, turbidity, and chlorophyll, at 15-minute intervals. Water quality mapping measures similar data monthly in 13 tributary systems, with a spatial intensity of up to 15,000 observations per system. The temporal and spatial richness of these data provide unique and challenging opportunities for analysis.

One of the key applications of these data is the assessment of water quality criteria as mandated by the Chesapeake 2000 Agreement between the Chesapeake Bay Program and the Bay watershed states. The criteria assessment methodology involves many aspects, including the development of a Chesapeake Bay-specific volumetric spatial interpolator program, temporal standardization of water quality mapping data with continuous monitoring data signals, and the calculation of cumulative frequency diagrams that incorporate spatial and temporal criteria exceedances into a two-dimensional curve that is evaluated versus a biologically significant reference curve. Example assessments will be presented.

In addition to criteria assessments, spatially intensive data are used to refine models that predict optimal sites for submerged aquatic vegetation restoration and highlight areas that fail habitat requirements for fisheries. Maryland DNR, through CICEET funding, is also developing a real-time GIS application for its water quality mapping systems, allowing field crews to adaptively sample, thus improving the delineation of features such as harmful algal blooms, areas of hypoxia or low water clarity.

F06. REMOTE SENSING CONTRIBUTIONS TO THE SOUTHEAST ATLANTIC COASTAL OCEAN OBSERVING SYSTEM (SEACOOS)

Frank Muller-Karger, Chuanmin Hu, Brock Murch, Judd Taylor, Robert Helber, and Robert Weisberg, University of South Florida
Edward Kearns, University of Miami
Charlton Purvis, University of South Carolina

The Southeast Atlantic Coastal Ocean Observing System (SEACOOS) is a distributed real-time ocean observation and modeling program that is being developed for a four-state region of the SE US, encompassing the coastal ocean from the eastern Gulf of Mexico to beyond Cape Hatteras. To complement the in-situ observations being collected in this domain, SEACOOS has engaged real-time satellite remote sensing capabilities at the University of South Florida and the University of Miami, including redundant ground station facilities. Satellite remote sensing activities include the collection of real-time satellite data (some tailored for the SEACOOS domain), the processing of data products, and the rapid delivery of these products via the SEACOOS web portal.

The SEACOOS data management approach employs Open GIS Consortium (OGC) protocols. This allows SEACOOS remotely sensed data products to be shared seamlessly and has provided support for the Integrated Ocean Observing System (IOOS) Interoperability Project. OGC standards allow for the IOOS Interoperability Project to consume SEACOOS remotely sensed data products and in-situ observations via Internet requests.

The integration of the remotely sensed data into the SEACOOS program has provided a regional context for the real-time in-situ time series data, as well as baselines for the region's surface waters from the historical satellite data records. The combination of these data sources will facilitate analyses by both coastal resource managers and researchers. The redundant data paths being established as part of the remote sensing activities will ensure that in the case of extreme events, the information flow to interested users will not be interrupted.

F07. DEVELOPING A FRAMEWORK FOR DISTRIBUTED AND DYNAMIC DATA SHARING AMONG THE COASTAL OCEAN COMMUNITY: GULF OF MAINE SPATIAL DATA PROJECT AND THE OPEN IOOS PORTAL

Tom Shyka, Gulf of Maine Ocean Observing System
Philip Bogden, Gulf of Maine Ocean Observing System and Southeastern Universities Research Association, Coastal Ocean Observing and Prediction Program
David McIlhagga, DM Solutions Group

In the past year the Gulf of Maine Ocean Observing System (GoMOOS), the Southeastern Universities Research Association (SURA) and DM Solutions Group worked with multiple government, academic and private industry partners to develop regional and national distributed data-sharing frameworks for the coastal ocean community. These projects were initiated by a joint FGDC and GeoConnections grant for the Gulf of Maine Framework Data Project. This project catalyzed activities in the Gulf of Maine region, building upon the years of effort at the Open Geospatial Consortium (OGC) and related developments in the NSDI and the Canadian Geospatial Data Infrastructure. This one year demonstration project resulted in a distributed framework data resource that spans international borders and connects more than a dozen regional, State, Federal, Provincial and other types of organizations (*www.gommap.org*). Even though the project funding has ended the regional partnership continues to grow and has formed the basis for the Gulf of Maine Ocean Data Partnership. Additionally, many organizations within the Canadian government are looking at this project as a model for future data sharing collaborations. Concurrent to the Gulf of Maine project, the SURA Coastal Ocean Observing and Prediction (SCOOP) program initiative leveraged the developing data sharing capacity to coordinate and develop the OpenIOOS portal (*www.openioos.org*), which demonstrates the capacity of the Integrated Ocean Observing System and starts putting the "I" in IOOS in an OGC-compliant fashion. These efforts have engaged the ocean-science community on the national scale. Indeed, a culture change seems to be underway that will have important implications for our nation's response to recommendations from the U.S. Commission on Ocean Policy. This presentation will discuss the successes and lessons learned from these related projects.

Habitat Restoration: Remediation and Landscapes
Kensington C

F08. A GEOSPATIAL TOOL FOR MANAGING THE ECOLOGICAL RISK OF CONTAMINATED WETLAND SEDIMENTS

Nabil R. Adam, Rutgers University
Francisco Artigas, New Jersey Meadowlands Commission
Vijay Atluri, Rutgers University
Soon Ae Chun, Rutgers University and Seton Hall University
Ed Konsevick, New Jersey Meadowlands Commission

Overseers of the New Jersey Meadowlands, a 32 square mile estuary with a legacy of contaminated wetlands, face challenges related to site remediation and restoration that require the synthesis of many complex environmental measurements. We have designed a tool that assists managers in meeting the challenges associated with contaminated sediments by linking databases of sediment information with quality guidelines developed by regulatory agencies. The result is a device that provides a meaningful interpretation of contaminant levels from one site or a collection of sites.

Each sample point contains a series of sediment chemical measurements at a given point on the surface of the earth and at different depths. Sites can be grouped into larger regions, forming a hierarchical organization. An interactive web-based map interface allows users to (1) retrieve and process site-specific sediment chemical data, matching the results with a library of sediment quality guidelines; (2) rank, prioritize and visualize the sites and chemical contaminant levels within a selected region to identify chemicals of concern and areas with high risk; (3) present the risk analysis data in both tabular and graphical formats by individual site or collections of sites; (4) dynamically update sediment sample results as they are obtained through the map interface; (5) present site specific information for clean up and restoration relating toxicity levels to regulations.

This enhancement to the decision-making process facilitates the flow of information to the managers responsible for restoration efforts. Ease of use is imperative; reducing large quantities of data to readable formats and comparison to meaningful criteria are formidable barriers that are broken by this tool. Relative risks associated with specific sites and contaminants can now be placed rapidly within a regional context, allowing for smart allocation of clean-up resources.

F09. A WEB-BASED GIS OIL SPILL PORTAL

Chris Spagnuolo, Concurrent Technologies Corporation Bremerton, WA

Numerous federal, state, and local agencies are tasked with responding to marine and coastal spill incidents throughout the Pacific Northwest. When responding to a spill event, responders rely on several documents to coordinate their response actions including the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP), the Northwest Area Contingency Plan (NWACP), and numerous regional Geographic Response Plans (GRP). The three plans are used as guidelines for response actions to marine and coastal spill incidents and to ensure consistency in response to spills. The information contained in these three plans are primarily paper maps, data matrices, and text based reports.

The Northwest Regional Response Team (RRT), consisting of United States Navy, Coast Guard, EPA, NOAA, and various Washington and Oregon state agencies, have relied on these bulky documents and paper maps when responding to oil spills in the past. The RRT realized that this was a time consuming and often outdated method of contingency planning and decision making during a marine pollution event. In response, the RRT is developing a web-based GIS Regional Spill Response Portal that will present information from the NCP, NWACP, and GRPs in a graphical, cohesive format that will facilitate quick and efficient response decisions by regional spill response end users. The Response Portal would provide a method of determining environmentally sensitive areas and provide real-time logistical information and response strategies for spill responders.

F10. COASTAL HABITAT ASSESSMENT AND PLANNING TOOL: LAKE ST. CLAIR PILOT STUDY AND POTENTIAL NATIONAL APPLICATION
Alyssa Olson Callahan, Perot Systems Government Services at the NOAA Coastal Services Center
Jen Boulware, I.M. Systems Group at the NOAA Coastal Services Center
Victoria Pebbles, Great Lakes Commission

The Integrated Coastal Management Tool is a software program designed to help you utilize ArcGIS technology (ESRI® ArcMap 8.3 with Spatial Analyst®) when making coastal resource management decisions. The tool uses basic data sets about your area to inventory habitats**,** assess land and water habitat conditions**,** identify and rank potential restoration and conservation sites, analyze "what if" scenarios for proposed changes in land use or land cover**,** and to create maps, reports, and data tables. Designed for the local planner, the coastal conservation group, and the coastal manager, the tool requires no in-depth GIS experience. Several resource management questions from the initial Lake St. Clair pilot project will be presented and discussed including, evaluation of proposed development, identification of potential conservation sites and restoration opportunities. The potential for application to areas outside of Lake St. Clair will also be discussed.

Information Technology for Managers
Kensington D

F11. COASTAL BIOPHYSICAL INVENTORY DATABASE TOOLS
Joseph Kinyon, Pacific Coast Science and Learning Center at Point Reyes, California

Recovering from a chemical spill (e.g. oil) is a challenge no coastal resources manager wishes to face. However, it is their responsibility to prepare for the worst while planning for the best.

At Point Reyes National Seashore and Golden Gate National Recreation Area, quick access to available data to enhance decision making was the driver behind the transformation of a Microsoft Access database into a "stand-alone" spatially enabled data browser and data entry software. The back-end data repository is an Access relational database coupled to a hierarchical file storage system and the front-end software is a user interface programmed in Microsoft Visual Basic 6 using MapObjects. Spatial queries are enabled through links between the .dbf file (a component of the ESRI format shape file showing the location of segments of coastal geology) and the Access XP database (a biological inventory and geophysical database of the intertidal zone along the California coast). Via the user interface, intertidal inventory data can be quickly entered and retrieved as well as browsed for sense of place and GIS analysis planning. Browsing includes viewing attribute information for the segment, imagery from the ground and air, and project methodologies.

Modeled after the "Alaska Coastal Resources Inventory and Mapping Database" (created at Glacier Bay National Park by Lewis Sharman and Bill Eichenlaub), this database was tailored to match the data and protocols adopted by the researchers at Point Reyes National Seashore and expands the data's potential for analysis through current and future ESRI software and Windows programming environments, without the overhead and licensing normally associated with GIS software.

This software was the final project for completion of a Master's of Science in GIS from the University of Redlands in the fall of 2004 and is used by the Point Reyes National Seashore, a member of the Bay Area Monitoring Network.

F12. A COMPREHENSIVE OVERVIEW OF INTERFEROMETRIC SYNTHETIC APERTURE RADAR (IFSAR) FOR COASTAL MANAGEMENT ORGANIZATIONS
Alistair Strachan, Intermap Technologies

There has long been a need by Remotely Sensed data users in the Coastal Management disciplines for continuous, accurate, large area datasets for consistent mapping, planning, and flood analysis. To fulfill this need, in the fall of 2004 the NOAA Coastal Service Center, entered into an agreement to acquire IFSAR imagery and elevation data for large regions in Florida, Alabama, Louisiana and Mississippi. This is the first phase of a planned multi-year program that is anticipated to include IFSAR data for the entire coastline of the continental United States. This coastal dataset is part of a larger contiguous national IFSAR dataset currently under collection. Work on the phase I of the NOAA CSC program commenced in the fall on 2004 and is expected to be completed in the Spring of 2005.

This presentation will be targeted to Coastal Management organizations that already are involved in coastal and flood mapping but are not fully familiar with IFSAR data, its derived products, and applications. Moreover, it will allow participants to gain an understanding of this well-established technology. It will discuss the contiguous, consistent, and predictable elevation and image base-layer data that are used in GIS applications, data integration, visualization, coastal and riverine mapping, flood mapping, feature extraction, route planning, control, and rectification of other images sources, all at national, regional, and local levels.

Of specific relevance to Coastal Management organizations is that NOAA, on behalf of US Coastal Management organizations, will distribute this data, as it is collected in this multi-year program.

F13. BUILDING GEOSPATIAL CAPACITY FOR WATER MANAGEMENT AGENCIES IN THE UPPER PEARL RIVER BASIN
Mary Love Tagert, and Jeffery A. Ballweber, GeoResources Institute at Mississippi State University
Kenneth C. Griffin, Pearl River Valley Water Supply District

Mississippi State University's GeoResources Institute (GRI) has been cooperating with state and regional agencies, county governments, and others on a growing effort in the Upper Pearl River Basin (UPRB) to establish geospatial layers for the management of land and water resources. The GRI has worked closely with the Pearl River Valley Water Supply District (PRVWSD) and other stakeholders in the UPRB to obtain existing geospatial data and create new data, when needed. High resolution, orthorectified imagery was collected for areas of land managed by the PRVWSD, and water and sewer infrastructure features were converted from paper "as-built" maps to geographic information systems (GIS) layers. The paper "as-built" maps were scanned and then georeferenced using the high-resolution, orthorectified imagery. Water and sewer infrastructure features were digitized from the scanned maps, and associated data, such as pipe diameter, were linked with the features. Once layers were assembled in a common projection, various layers could be overlain for numerous purposes, such as planning new developments or managing water resources. As new data is obtained and compiled for the PRVWSD, it is shared with other local stakeholders, such as county GIS personnel. Geospatial layers help to increase operational efficiency and improve the accuracy of decisions made by managers regarding, in particular, water quality, water quantity, and public health concerns. Geospatial data layers help managers and other officials better plan for future needs and changes, and voluntary data sharing among agencies presents ideal opportunities to build or expand locally led watershed advisory groups.

NATIONAL STATES GEOGRAPHIC INFORMATION COUNCIL DISCUSSION SESSION
2:30 to 4:00 p.m.
Eton

F14. NATIONAL STATES GEOGRAPHIC INFORMATION COUNCIL DISCUSSION SESSION
Zsolt Nagy, National States Geographic Information Council
Bill Burgess, BurGIS, LLC

The National States Geographic Information Council (NSGIC) is an organization of States committed to efficient and effective government through the prudent adoption of geospatial information technologies. Members of NSGIC include delegations of state GIS coordinators and senior state GIS managers from across the United States. Other members include representatives from Federal agencies, local government, the private sector, academia and other professional organizations. A rich and diverse group, the NSGIC membership includes nationally and internationally recognized experts in GIS, geospatial data production and management, and information technology policy.

During this session, NSGIC's Washington Liaison (Bill Burgess) and Current President (Zsolt Nagy – North Carolina) will describe the current activities of NSGIC, including the exciting new Fifty States Initiative, The National Map Partnership Project, NSGIC's Legislative Agenda, its liaison activities with FEMA on the Multi-hazard Map Modernization Program, and its liaison activities with NASA. Each of these projects will impact the Coastal GIS community. Therefore, this will be an interactive session designed to answer the questions of those in attendance.

RECEPTION IN PALMETTO PAVILION
7:00 to 10:00 p.m.

Conference attendees will be treated to a private "Beach Blast" in the Palmetto Pavilion at Kingston Plantation. The reception will include heavy hors d'oeuvres and a cash bar. Entertainment will be provided by "too MUCH Sylvia"—a high-energy, beach music band. So get ready to get sand in your shoes and shag the night away.

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 $50 a person. Attire is casual.

Thursday, March 10

EARLY MORNING SESSIONS
9:00 to 10:30 a.m.

Benthic Mapping: Habitat Models
Kensington A

G01. SEAGRASS HABITAT PREDICTION AND LEVEL OF PROTECTION IN THE CARIBBEAN
Colette Wabnitz and Louisa Wood, Fisheries Centre, University of British Columbia

Seagrasses are valuable coastal habitats that provide important ecological and economic goods and services globally. Their distribution, although still extensive, is rapidly declining in the face of growing anthropogenic pressures. Nutrient and sediment runoff, boating, land reclamation, and destructive fishing practices are some of the threats facing seagrasses. Despite the apparent need for better management, they continue to be overlooked and poorly protected, and the actual extent and level of protection is unknown. Monitoring of seagrass declines and their impacts is made difficult by a general paucity of information on seagrass habitat distribution worldwide. Recent efforts to mitigate this problem culminated in the publication of the World Atlas of Seagrasses. However, this spatial database consists mostly of point data, and areal estimates of seagrass extent were made by applying a 10km buffer to these points.

Our aims were to i) improve estimates of seagrass bed area and distribution in the Caribbean, and ii) assess their level of protection, in order to facilitate and inform management and conservation strategies.

Here we present two spatial interpolation models to predict seagrass distribution, using available point and polygon data, as well as biophysical parameters, including bathymetry and temperature. LANDSAT TM satellite images from the region were used to validate the models' outputs. We also compare these results to those of the previous buffer model. These three predicted distributions were then overlaid in a GIS with information on marine protected areas (MPAs) for the region. This analysis assesses the impact of using different spatial models to predict habitat distribution and seagrass protection level.

G02. LINKING BENTHIC COMPLEXITY, HARDBOTTOM AND FISH AGGREGATIONS IN MARINE PROTECTED AREAS PROPOSED BY THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL
Daniel Dunn and Patrick Halpin, Nicholas School of the Environment and Earth Sciences, Duke University

Marine Ecosystem Management has been promoted as a more comprehensive framework for managing marine environments and protecting and restoring ailing fisheries stock levels. Geospatial analysis tools now play an increasing role in linking the distribution of benthic habitats, oceanographic conditions and fish aggregations with planned management actions, such as the establishment of marine protected areas (MPAs). The South Atlantic Fishery Management Council is in the process of developing Amendment 14 to the Snapper Grouper Fishery Management Plan (FMP) which will implement MPAs as a management tool to protect over fished, deepwater snapper-grouper species. This amendment has been put forward in an effort to bring the Snapper-Grouper Fishery Management Plan into full compliance with the Sustainable Fisheries Act of 1996 (SFA).

The designation of the MPAs is based on a wide variety of criteria, sources and assumptions, including the known or expected presence of hardbottom. Benthic Complexity algorithms may offer an inexpensive and quick alternative to the use of fish trawl data and sidescan sonar in the detection of this type of fish habitat. This Geographic Information System (GIS) technique involves the use of bathymetric data to determine the physical complexity of the seafloor. High levels of complexity (rugosity) are thought to correspond to hardbottom environments, and thus, benthic complexity is believed to be a surrogate for hardbottom. A thorough analysis of the link between benthic complexity, hardbottom habitats and fish aggregations is required to understand the efficacy of the MPAs proposed by the SAFMC and to aid in the planning and selection of future MPAs and alternative management strategies.

Coastal Mapping and Shoreline Change: Survey Methods
Kensington B

G04. LIDAR SURVEYS, TOTAL STATION SURVEYS, AND AERIAL PHOTOGRAPHY FOR DUNE/BEACH TEMPLATE DESIGN AT FIRE ISLAND NATIONAL SEASHORE

Jeffrey Pace and Norbert Psuty, Rutgers, The State University of New Jersey

Fire Island National Seashore is in a unique setting of National Park Service units interlaced among private communities. Dune and beach management is a complicated issue of preservation within the dynamics of the natural system. In response to requests for privately funded beach nourishment projects in the communities, the Park was in need of a scientific, statistically based template of the dune and beach.

25 years of ground surveys utilizing a Sokkia Total Station and 3 LIDAR surveys were layered in a GIS to identify and establish the current pseudo-natural dune crestline and to ground truth the LIDAR surveys. In addition, aerial photography was used to map the existing and historic natural dune crestline. The 2000 LIDAR survey, chosen as a pre-erosional condition, was then systematically sub-sampled with 122 dune/beach profiles. Each profile was then analyzed to summarize a suite of template attributes including dune crest height, crest width, dune width, beach/dune interface elevation (dune toe elevation) and beach width. The approach allowed for analysis of dune/beach variation on public versus private lands and allowed for a significant increase in profile locations over traditional methods. Specifically, this methodology quantified the different dune and beach morphologies in public lands versus those in private lands where management practices differ.

G05. MODERN TECHNIQUES FOR IMPROVED TOPO/BATHY ELEVATION MODELING: PART 1 – DATA ACQUISITION

Christopher W. Freeman and David J. Bernstein, Geodynamics, Geologic and Oceanographic Services
John McCormick, U.S. Army Corps of Engineers, Wilmington District

The land-sea interface is a zone where significant sediment transport can occur very rapidly to alter landscapes surrounding economic infrastructure, important cultural heritage sites or environmentally sensitive areas. Coastal geologists and engineers recognize that while it is critical to quantify volumetric and feature change within this zone, it is unfortunately also one of the hardest regions to map. Shore-normal profiles have been historically used to measure morphological change along the beachface and nearshore zones, but these techniques necessarily

assume that a series of two-dimensional (2D) profiles is representative of the actual three-dimensional (3D) morphology. Accurate assessments of the complex spatio-temporal changes observed at the land-sea interface require a more robust data acquisition and processing method.

Improved mapping instrumentation facilitates the collection of high-density data needed for detailed surface elevation modeling and datum-derived shoreline analysis. The methods by which these data are acquired remain paramount to accurately merging topographic and bathymetric data seamlessly at the land-sea interface. Data acquisition for the *Shoreline and Nearshore Digital Mapping and Analysis Program* (*SANDMAP*) integrates various ground- and marine-based instruments with specific survey strategies to capture accurate 2D and 3D topo/bathy data. *SANDMAP* scientists use real-time kinematic (RTK) GPS systems in conjunction with an all terrain vehicle for high-resolution topography. Bathymetric surveys also employ RTK-GPS for cm-scale positioning and on-the-fly tidal corrections when integrated with ultra-shallow water single beam sonar from a personal watercraft or multibeam sonar from a shallow draft launch.

This combination of modern instrumentation, unique acquisition platforms and high-density, morphologically derived survey design allow for maximum efficiency in seamless topo/bathy elevation modeling (see part 2 in this series: *Surface Modeling & Analysis*). Grid-based data products from our *SANDMAP* techniques provide coastal scientists with a complete 3D dataset that spans the land-sea interface for various geospatial analyses in a multidisciplinary GIS environment.

G06. MODERN TECHNIQUES FOR IMPROVED TOPO/BATHY ELEVATION MODELING: PART 2 – SURFACE MODELING AND ANALYSIS

David J. Bernstein and Christopher W. Freeman, Geodynamics, Geologic and Oceanographic Services
Helena Mitasova, Department of Marine, Earth & Atmospheric Sciences, North Carolina State University
John McCormick, U.S. Army Corps of Engineers, Wilmington District

Modeling the complex physical and geological interactions along the land/sea interface is a four-dimensional challenge that requires spatially dense data and flexible processing routines to accurately assess spatial and temporal changes. Modern mapping techniques (e.g., RTK-GPS, single- and multibeam sonar, and topographic and bathymetric LIDAR) provide the density of data needed to create accurate surface representations of these complex systems. However, these modern survey platforms produce massive amounts of data that are typically characterized by over-sampling, noise and anisotropy. The reduction of these data into an accurate surface model presents many challenges. The *Shoreline and Nearshore Digital Mapping and Analysis Program* (*SANDMAP*) handles these processing challenges through customized geospatial and QA/QC processing routines to model surface geometry from various acquisition techniques.

Digital elevation models are now customized and more accurate through tunable interpolation algorithms within many of the open source and proprietary GIS packages. While a TIN (Triangular Irregular Network) is most commonly used in elevation modeling, it becomes problematic when a series of surfaces, each based on a different set of measured points, needs to be compared. To preserve most of the detail captured from these high-density coastal surveys and at the same time minimize artifacts commonly created by standard interpolation algorithms such as TIN, a Regularized Spline with Tension and Smoothing or Universal Kriging method is often applied.

The selection of gridding method depends on the spatial distribution of the input data, resolution of

the output grid and the anticipated properties of the modeled terrain. These factors are of principal importance when constructing accurate and seamless topo/bathy elevation models used to better assess complex coastal change through geospatial analysis and advanced visualization. The integration of topo/bathy models into multidisciplinary GIS is increasingly being used to support advanced scientific understanding and management of the coastal zone.

Ocean Observing Systems: Data and Management
Kensington C

G07. LOCATE THE MEAN HIGH WATER LINE – WHY PUT OFF UNTIL TOMORROW WHAT YOU CAN DO TODAY?

Douglas Thompson, PLS, President, Atlantic Professional Development

Now you can accurately establish the height of mean high water or mean low water, at a project site with only a few basic tools and 2-3 hours of your time. A new self-reading water measurement system (patent pending) automatically records high and low tidal measurements at the nearest National Ocean Service tide station (Control). Simultaneously, a similar device records tidal measurements of the same tide cycle at the project site (subordinate). High and low tide heights of both tide stations are entered into a spreadsheet programmed with NOS formulae including the current 19-year Metonic cycle to compute the required tidal datum. This NOS procedural methodology and reduction process is called “comparison of simultaneous observations.” A brief tutorial will guide users through a sample observation session and computations.

The line of mean high water or mean low water is typically the baseline from which (1) offsets define the location of jurisdictional setbacks, buffer zones, CZM construction setbacks and local building setbacks, (2) dock design and site permitting, (3) trespass/encroachment issues for beachfront properties, and (4) the boundary separating state-owned sovereignty submerged land from uplands subject to private ownership.

New London, Connecticut, September 9 and 10, 2004 – Tropical Depression Frances, earlier known as Hurricane Frances passed here earlier today while a workshop of fifteen land surveyors from the New England area observed low tide on the Thames River. The workshop titled *“Field Practices; Mean High Water Surveying for Professional Land Surveyors”* was sponsored by the *Connecticut Association of Land Surveyors and American Congress of Surveying and Mapping, New England Section* was also pre-approved by several New England states as a land surveyor continuing education class.

A briefing of workshop objectives, logistics support and a summary of the resulting tidal datums will provide interesting discussion. Participants will learn how to: set up a tide study, install tide staffs, maintenance of tide staffs, find and understand the NOS tidal benchmark sheets, data collection, and computations to determine MHW/MLW

G08. COASTMAP: AN ARCGIS EXTENSION FOR INTEGRATING TEMPORAL METOCEAN DATA

Eoin Howlett and Craig Swanson, Applied Science Associates, Inc.
Matthew Ward, Applied Science Associates, Inc.
Malcolm Spaulding, Ocean Engineering, University of Rhode Island

COASTMAP is a globally re-locatable, integrated system for real time observation, modeling, and data distribution for estuarine, coastal, shelf, and ocean waters. COASTMAP is a Windows-based application (client and server) with end-to-end capability; from data collection to distribution of data and products to users.

The COASTMAP client is available as an ArcGIS extension that can connect to a COASTMAP data server or an IOOS OpenDAP server to integrate a variety of temporal data such as time series data (deployed current meters or water quality instruments), gridded numerical model output, fields of information (CODAR surface currents) or raster data (weather satellite imagery). COASTMAP includes custom layers for native support of NetCDF, GRIB, and other standard formats.

COASTMAP links to environmental models (hydrodynamic, meteorological, oil/chemical spill transport and fate, search and rescue, atmospheric plumes from chemical releases, waves, crisis management systems) to provide local nowcast and forecast capabilities, and to incident command management systems for responding to emergencies.

The system currently provides access to US hydrodynamic and meteorological models, a variety of observational data including time series and satellite data. The application is available in two types: Professional (thick client) and Web-browser (thin client). COASTMAP technology is currently being developed for and used by a number of federal agencies including the US Coast Guard, US Navy, NOAA and the US Geological Survey.

G09. NEAR REAL-TIME OCEAN OBSERVATIONS ONLINE: DATA MANAGEMENT WITHIN THE SOUTHEAST ATLANTIC COASTAL OCEAN OBSERVATION SYSTEM (SEACOOS)

Charlton Purvis, Jeremy Cothran, Madilyn Fletcher, and Dwayne Porter, University of South Carolina
Jeffery Donavan, Robert Helber, Chuanmin Hu, Frank Muller-Karger, Brock Murch, Vembu Subramanian, Judd Taylor, and Robert Weisberg, University of South Florida
Sara Haines and Harvey Seim, University of North Carolina
Edward Kearns and Elizabeth Williams, University of Miami
Jim Nelson, Skidaway Institute of Oceanography

Even though a picture can speak a thousand words, can it meaningfully represent millions of near real-time ocean data observations from a variety of data sources? It is within the SEACOOS online observation portal that SEACOOS partners and affiliates coordinate and integrate disparate datasets into an interactive geographic information system (GIS).

SEACOOS partners and affiliates contribute to a centralized data repository by providing both in-situ and remotely sensed data in a standard format. These data are aggregated, processed, and normalized to provide a view of information ranging from near real-time in-situ wind and sea surface temperature data to near real-time remotely sensed products, including sea-surface temperature, ocean color, and true color images. The coordination of disparate datasets, namely their respective temporal and spatial resolutions, was made possible by the use of relational databases and other technologies.

Open source software solutions are well suited for the database normalization back-end tasks as well as the core GIS functions at the front-end. In addition to typical GIS mapping functionality, the online observation portal includes animation capabilities, robust point data and raster data querying capabilities, and time-series graphing utilities. Refining the interface to meet both general and

specific user needs remains an ongoing process, but the modularity of the existing tools within the portal provides an exceptional foundation on which to build.

Land Use and Community Planning: Impacts to Resources
Kensington D

G10. WORKING WITH DEVELOPERS TO EVALUATE AND REDUCE BACTERIA AND NUTRIENT LOADING IN THE SOUTH CAROLINA LOWCOUNTRY
R. Heath Kelsey, Baruch Institute for Marine and Coastal Sciences, University of South Carolina
Chris Marsh, LowCountry Institute
David White, NOAA Hollings Marine Lab
Patricia Richards, Crescent Resources at Palmetto Bluff
Dwayne Porter, Baruch Institute for Marine and Coastal Sciences and the Arnold School of Public Health, University of South Carolina
Geoff Scott, NOAA Ocean Service, Center for Environmental Health and Biomolecular Research

Fecal coliform loading and modeling research conducted at two developments in Beaufort County, South Carolina, has presented unique opportunities to work with developers to evaluate and reduce fecal coliform loading from nonpoint sources. Stormwater sampling at the Chechessee Creek Club golf course was conducted for one year under the Land Use-Coastal Ecosystems Study (LU-CES) program. Results on loading and Best Management Practice (BMP) effectiveness were presented to development owners and management staff, enabling researchers to discuss nonpoint source pollution and development linkages. Options to reduce nonpoint source loading from the golf course were discussed.

Involvement with the local development community expanded to include the Palmetto Bluff development, where a long-term program for fecal coliform and nutrient load monitoring was initiated. Ambient water sampling was supplemented by sampling during storm events to evaluate baseline bacterial and nutrient loading. Sampling will continue throughout the development process to evaluate changes in hydrology and loading rates. In both cases, engagement with developers has enabled researchers to educate important stakeholders about development impacts to water quality, and specific ways to reduce them.

G11. URBAN DEVELOPMENT ALONG THE SHORELINE OF THE CHESAPEAKE BAY AND ITS TIDAL TRIBUTARIES
Peter R. Claggett, U.S. Geological Survey
Renee Thompson, Chesapeake Research Consortium
Menchu Martinez, U.S. Environmental Protection Agency

The Chesapeake Bay watershed encompasses some of the fastest growing regions in the United States, particularly areas within commuting distance to Washington, D.C., Baltimore, Maryland, and Richmond and Norfolk, Virginia. Much of the western shoreline and tidal tributaries of the Chesapeake Bay is within commuting distance to these urban areas. The conversion of forests and farmlands to residential and commercial development along the shoreline threatens to degrade the aquatic and terrestrial resources of the Bay watershed. A better understanding of development along the shoreline is needed to promote coordination among local jurisdictions for managing growth and to assess the implications of development trends on the health of the Bay.

This study tests the hypotheses that the rate and type of development occurring along the western and eastern shorelines of the Chesapeake Bay and its tidal tributaries are statistically different compared to neighboring inland areas. Data from classified Landsat 7-ETM imagery and the U.S. Census Bureau are analyzed to compare changes in impervious surfaces, single and multi-unit housing, and vacant seasonal housing from 1990 to 2000 at multiple spatial scales and distances from the shoreline.

G12. THE BALDWIN COUNTY WETLAND CONSERVATION PLAN
Cara Stallman, Senior Natural Resource Planner, Baldwin County, Alabama
Ken McIlwain, Natural Resource Planner, Baldwin County, Alabama

The objective of the Baldwin County Wetland Conservation Plan (BCWCP) is to provide local decision-makers the best tools possible to make wise land-use decisions regarding Baldwin County's wetland resources. The development of a Wetland Protection Overlay District (WPOD) was incorporated into the Baldwin County Zoning Regulations. The development of a GIS wetland data layer containing information on wetland locations, types and functional capacity for wetlands throughout Baldwin County was developed. Third, this project implemented a wetland education/ outreach program for area stakeholders. Finally, wetland restoration/construction projects were designed and implemented at selected sites. Wetland resources perform many natural functions throughout the County's landscape, such as: floodwater storage; sediment/toxicant/nutrient removal; groundwater recharge; and provide habitat for fish and wildlife.

National Wetland Inventory (NWI) data was acquired, merged, edge-matched and verified using color infrared photography. Baldwin County staff and United States Army Corps of Engineers (USACE) staff groundtruthed the wetland data through a rigorous wetland validation project. It was evaluated that the Baldwin County Digital Wetland Layer (BCDWL) is 85.6% accurate in representing jurisdictional wetlands.

In order to assess the functions of each wetland area throughout the County, a remote functional assessment model was developed using GIS software through the integration of other remotely sensed data layers such as flood zones, National Wetland Inventory data, and endangered species, among others. The model was written, executed and calibrated with the support of an interagency Technical Advisory Committee. The results categorized all of Baldwin County's wetlands as suitable for conservation, enhancement, or restoration. The resulting data is available to local stakeholders in digital and hard copy format. The results provide watershed-based wetland restoration strategies for Baldwin County's wetlands.

BREAK
10:30 to 11:00 a.m.

LATE MORNING SESSIONS
11:00 a.m. to 12:30 p.m.

Remote Sensing Applications: Mapping with LIDAR
Kensington A

H01. IMPROVED COASTAL MAPPING THROUGH SENSOR FUSION
Maryellen Sault, Christopher Parrish, Jon Sellars, Stephen A. White, and Jason Woolard
NOAA Ocean Service, National Geodetic Survey

The national shoreline provides the critical baseline for demarcating America's marine territorial limits, including its Exclusive Economic Zone, and for the geographic reference needed to manage coastal resources. The method used today by NOAA to delineate and attribute shoreline is through stereo photogrammetry using tide-coordinated aerial photography. However, light detection and ranging (lidar), hyperspectral imaging and other remote sensing technologies show promise for shoreline mapping. Through fusion of data from multiple sensors, it may be possible to greatly improve the available information about the coastal environment and increase efficiency in NOAA programs.

NOAA's National Geodetic Survey (NGS) is conducting a data fusion research project in collaboration with the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) and other NOAA partners. In March 2004, hyperspectral imagery, topographic lidar data, and high-resolution digital color imagery were collected simultaneously aboard the NOAA Citation for four coastal project areas in Florida: DeSoto Beach, St. Pete Beach, Ft. Lauderdale, and Looe Key. The data are being used to support a number of research objectives, including shoreline extraction and feature attribution and coral reef mapping. We present the details of the data collection and lessons learned from simultaneous acquisition with three different sensors. We conclude with preliminary results from our shoreline mapping research.

H02. DIGITAL ELEVATION DATA IN MARYLAND: FROM ACQUISITION TO USE BY COASTAL COMMUNITIES

Ken Miller, Maryland Department of Natural Resources, Watershed Information Services
Audra Luscher, Maryland Department of Natural Resources, Coastal Zone Management
Joe Gavin, U.S. Army Corps of Engineers, Philadelphia District

Maryland has been collecting detailed digital elevation data using Light Detection and Ranging (LIDAR) technology in its coastal communities since 2002. These data, suitable for producing topographic contours at 2-foot intervals, are extremely accurate and therefore very useful for a variety of coastal hazard planning and response activities. However, the data are quite voluminous and often difficult to work with, especially by many of the local governments who may not have the technical capability to store, manage and process these data into useful products.

The specifications used to collected the data, partnerships formed to fund its collection and the products developed for local government use will be explored. In particular, Hurricane Storm Surge Maps, produced by the US Army Corps of Engineers and used at the local level, will be showcased. Plans for other products such as GIS tools, contours and other map products will also be highlighted.

H03. USING AIRBORNE LIDAR BATHYMETRY TO MAP SHALLOW RIVER ENVIRONMENTS

David Millar, Fugro Pelagos, Inc.
John Gerhard, Woolpert LLP
Robert Hilldale, Bureau of Reclamation

Despite the fact that Airborne Lidar Bathymetry (ALB) systems have been in existence for over 20 years, they have rarely been used in riverine environments. Consequently, obtaining bathymetry in shallow river conditions has continued to be a major technical challenge to surveyors and engineers.

After consulting with Optech, Woolpert and Fugro Pelagos regarding newly developed capabilities to recover bathymetry data into very shallow water depths, the Bureau of Reclamation decided to proceed with an ALB survey using the SHOALS-1000T. In August 2004, that system was used to collect bathymetric soundings at a 2m x 2m sounding density on two shallow water reaches of the Yakima River in Washington. ALB technology may now provide an alternative method for collecting bathymetry data in rivers in addition to providing the ability to collect this data in locations that were previously off limits due to access issues or unsafe boating conditions. Further, long reaches can be covered very quickly with this airborne technology.

Accurate ALB data can be combined with the SHOALS-1000T's integrated terrestrial data to provide a complete representation of the river channel and floodplain. This type of final product is something river engineers have been seeking for many years. The resulting terrain model can be applied to numerical models to study hydraulic conditions as they relate to fish habitat, sediment transport, flooding and levee configuration. With the improved data density provided by the ALB, numerical models may be more reliable due to fewer assumptions regarding channel bed configuration. Additionally, multidimensional hydraulic models become much more practical to use due to the increased data density and comprehensive coverage of ALB data.

Fisheries and Protected Species Management
Kensington B

H04. BEYOND MAPPING: BUILDING ANALYTICAL TOOLS FOR ASSESSING WEST COAST GROUNDFISH ESSENTIAL FISH HABITAT (EFH) USING GIS AND BAYESIAN NETWORK MODELS

Allison Bailey, TerraLogic GIS
Steve Copps, NOAA Fisheries, Northwest Region
Graeme Parkes, Marine Resource Assessment Group
Bob Burn and Colin Grayer, University of Reading Statistical Services Center
Runi Vilhelm, Marine Resource Assessment Group
Levon Yengoyan, TerraLogic GIS
W. Waldo Wakefield, NOAA Fisheries, Northwest Fisheries Science Center
Mary Yoklavich, NOAA Fisheries, Southwest Fisheries Science Center
Chris Goldfinger, Active Tectonics and Seafloor Mapping Lab, Oregon State University
Gary Greene, Center for Habitat Studies, Moss Landing Marine Laboratories

Fisheries managers, like most other coast resource managers, suffer from a lack of data and tools for successfully meeting their scientific and regulatory challenges. This project was initiated to meet the analytical needs of National Marine Fisheries Service (NMFS) and the Pacific Fishery Management Council while developing an Environmental Impact Statement (EIS) for Pacific Coast groundfish Essential Fish Habitat (EFH). The outputs from these analytical tools directly support a comprehensive risk assessment and policy development within the EIS process.

The development of the analytical tools required two distinct by interdependent phases: (1) data consolidation and (2) data synthesis and modeling. Data consolidation included compilation of existing data to describe groundfish habitat, including marine geology, vegetation, seafloor depth, and latitude, into a geographic information system (GIS). In addition, information about the 80+ species of groundfish and their habitat associations was gleaned from scientific literature and entered into a database. Fisheries research surveys were also used to determine depth and latitude ranges for many of the groundfish species.

A Bayesian network model was developed to synthesize the species and habitat information. The model incorporates probabilities of species/habitat associations and uncertainties into the output. This probabilistic framework was well received by scientists, policy-makers, and other constituents because it acknowledges the uncertainty in the data. For each species, the model generates a habitat suitability probability (HSP) value for every habitat polygon delineated in the GIS. For the EIS, alternatives were developed by setting HSP thresholds for some or all groundfish species.

The project benefited from an interdisciplinary team that provided a high level of technical expertise in GIS, statistics, modeling, databases, geology, fisheries biology and ecology and marine policy. The EFH Bayesian network model, coupled with GIS, is a powerful and flexible tool that can incorporate new data and be used in other geographic regions or other types of species and habitats.

H05. USING GIS AS A TOOL IN ASSESSING HABITAT USAGE OF GRAY WHALES, *ESCHRICHTIUS ROBUSTUS*, IN THE COASTAL WATERS OF BRITISH COLUMBIA

Michelle R. Kinzel, William Megill, Deborah Randall, and Lei Lani Stelle, Coastal Ecosystems Research Foundation

The gray whale, *Eschrichtius robustus,* is one of the few species of wildlife to experience a population recovery sufficient to remove it from the Endangered Species List. This species has rebounded from near extinction and scientists are theorizing that the population is approaching a capacity carrying limit. As the population has increased, the need for suitable feeding habitat in the northern feeding grounds for this migratory animal has expanded. There are several congregations of individual whales that have been observed and studied in various locations along the northern ends of the migratory route, and this study assess the habitat usage of one such group of whales along the coast of British Columbia.

Geographic information systems (GIS) provide a useful tool to assess distribution, habitat use and movement patterns of animals based on GPS sightings. Using ArcView software in conjunction with the Animal Movement Extension has provided for the mapping of movement patterns and occupancy of a group of summer resident gray whales in British Columbia, Canada. This study analyzes and assesses the habitat usage of 100 individual gray whales over a period of 10 years in a summering feeding ground off the coast of British Columbia, Canada. Effective and wise management decisions are needed in conjunction with the rapid development of our Pacific coastal resources. GIS serves as a tool that is useful for scientists as well as coastal managers. This study highlights the use of GIS in determining habitat usage and needs assessment for populations of wild animals.

H06. BUILDING AN INTEGRATED DATA ENTRY AND MAPPING SYSTEM FOR THE NORTHEAST COD TAGGING PROGRAM USING ARCIMS AND ARCSDE

Bill Duffy and Tom Lynch, Northern Geomantics
Shelly Tallack, Cod Tagging Program Manager, Gulf of Maine Research Institute

The Northeast Regional Cod Tagging Program's mission is to document cod movements and population distribution throughout the Gulf of Maine. To do this, it is essential that the day-to-day data collection efforts of more than a half-dozen US and Canadian marine research organizations be coordinated and managed.

The Cod Tagging Data Entry and Mapping System includes an online data entry application which allows scientists to input codfish capture and release information from research cruises into a central ArcSDE database. Program managers at the Gulf of Maine Research Institute can also log in online to verify newly-entered data. Once approved, the data is automatically added to the Internet mapping site, where it can be viewed and queried by scientists and the general public.

The Cod Tagging Data Entry and Mapping System serves as a model for other mark and recapture programs. The overarching principles and architecture of the system could also be applied to many types of fishery survey projects where data collected by multiply groups must be compiled into a single database.

Benthic Mapping: Marsh, Kelp, and SAV
Kensington C

H07. MAPPING THE DISTRIBUTION OF SUBMERGED AQUATIC VEGETATION AND SALTMARSH IN THE PADILLA BAY NERR, 2004

Suzanne Shull and Douglas A. Bulthuis, Padilla Bay National Estuarine Research Reserve

Three species of eelgrass (*Zostera marina*, *Z. japonica*, *Ruppia maritima)*, macroalgal mats (*Enteromorpha and Ulva*), and salt marsh (*Salicornia*; *Distichlis*; *Atriplex*) vegetation were identified in the field and mapped from true color orthorectified (0.15 m resolution) aerial photography. The orthophotography was contracted out and acquired on June 4, 2004 at a -1.2 meter (-3.9') tide. More than 1000 groundtruth GPS points were obtained and attributed using the following classification categories: 51-100% cover, 11-50% cover, less than 10% cover, and bare substrate. In an attempt to identify mixed areas and changing coverage of the non-native *Z. japonica* and the native *Z. marina* species, the percent cover categories were further grouped into classes of "pure" stands (greater than 50% cover by one species) and mixed stands (less than 50% cover by all species present). Digital photos were taken at most of the groundtruth sites, downloaded, and automatically linked geographically to the GPS tracklog data using Pixpoint software. Photointerpretation utilized the extensive ground-truth data, contact print photography, and the digital photography to guide on-screen delineation of the vegetated and non-vegetated areas using ArcGIS. Some of the groundtruth data was held back from the mapping process to be used for accuracy assessment of the final product. The comprehensive map data will be used to identify historical changes in the nearshore vegetation of Padilla Bay and to monitor any future changes.

H08. HISTORICAL KELP SURVEYS IN CALIFORNIA

Paul Veisze, California Resources Agency, Department of Fish and Game

Kelp is critical habitat for a variety of species in the California nearshore ecosystem. While kelp surveys have been conducted in California over the last several decades, a robust, quantitative account of kelp conditions and trends is lacking for the State's entire coast. This situation will likely persist unless normalization of various kelp survey technologies is conducted in a modern GIS. Standardized metadata for the disparate extents of surveys are also needed.

This project will focus on historical kelp surveys conducted by the California Department of Fish and Game. Technology and cost alternatives for re-measurement of Department aerial film from the 1960s through the 1980s will be analyzed. Selected methodologies will be applied to representative samples of the kelp surveys, as well as to other historical imagery collections of interest to the coastal management community, such as Elkhorn Slough National Estuarine

Reserve. Results will be compared to recent, remote sensing-based findings. Recommendations and specifications for future kelp survey technologies will be presented.

H09. A MULTI-SCALE SEGMENTATION APPROACH TO MAPPING SEAGRASS HABITATS
Richard G. Lathrop and Paul Montesano, Center for Remote Sensing & Spatial Analysis, Rutgers University
Scott Haag, Center for Remote Sensing & Spatial Analysis, Rutgers University, and Jacques Cousteau National Estuarine Research Reserve

The purpose of this study was to map the areal extent and density of submerged aquatic vegetation within the Barnegat Bay and Little Egg Harbor, New Jersey as part of ongoing monitoring for the Barnegat Bay National Estuary Program. We examined the utility of multi-scale image segmentation/object-oriented image classification approaches to seagrass mapping. While the aerial digital camera imagery employed in this study had the advantage of flexible acquisition, suitable image scale, fast processing return times and comparatively low cost, it had inconsistent radiometric response across the individual images. While we were not successful in using the eCognition software to develop a rule-based classification that was universally applicable across the 14 individual image mosaics that comprised our 73,000 ha study area, the manual classification approach that we developed provided a flexible and time effective approach to mapping seagrass. From a theoretical standpoint, the multi-scale image segmentation/object oriented classification approach closely mirrored our conceptual model of the spatial structure of the seagrass beds and associated bottom features. Rather than visualizing the seagrass habitats as simply a collection of like pixels, this object oriented approach successfully extracted the spatial features of ecological interest. This multi-scale image segmentation approach coupled with field transect/point surveys has the potential to be more replicable than strictly boat-based surveys and/or visual image interpretation and allow for more robust conclusions regarding change in areal extent, location and spatial pattern of seagrass beds through time.

Land Use and Community Planning: Visualization Techniques
Kensington D

H10. FINGER LAKES DECISION SUPPORT SYSTEM PROJECT
David W. Carr, Institute for the Application of Geospatial Technology

Under a NASA funded initiative, the Institute for the Application of Geospatial Technology (IAGT) is engaged in an effort to develop a Web-based system that integrates 2D and 3D interactive geospatial visualization and analysis technology to enhance information sharing and decision support for watershed management and beyond. The goal is to provide a multi-jurisdictional tool that can be used across all levels of government and organizations for decision making.

Forming a framework for the project are these focus areas: surface/groundwater interaction; viewshed analysis and open space conservation; agricultural conservation. Utilizing the technology to compare and contrast these characteristics through a taxonomic ranking is a primary goal of the project. The proof of concept will be to use the resulting localized environmentally sensitive areas in conjunction with probability of growth models to reveal those areas that should be conserved or carefully managed for future wise use and growth.

H11. ARCIMS FOR LAND USE PLANNING IN AMERICAN SAMOA
Troy D. Curry and Tali Tuinei, American Samoa Coastal Zone Management Program

The American Samoa Department of Commerce has implemented within the American Samoa Coastal Zone Management Program a planning strategy that incorporates the use of ESRI's ArcIMS for natural resource conservation. The ArcIMS website uses data from the American Samoa GIS User Group's "Databank" to identify the site area being considered for the Project Notification and Review System (PNRS). PNRS is the land use permitting process for the Territory of American Samoa. Land use changes including development, construction, and modification of land on the Island require an individual to submit an application for a land use permit to ASCMP. An applicant submits a site plan to the Conservation Resource Officer (CRO) for the proposed project. The CRO then accesses the ArcIMS site to determine information regarding the surroundings of the proposed site. Information that is derived from the ArcIMS site includes GIS data layers for environmentally sensitive areas such as wetlands, mangroves, and the coastline. Additionally, hazards including flooding and landslide risk can be determined from the GIS data. The data layers used for the ArcIMS site include infrastructure (buildings, roads), hazards (Flood Insurance Rate Maps, Base Flood Elevation, landslide risk, landslide events from the past), and satellite imagery (2001 Space Imaging IKONOS, 2003/2004 QuickBird). The final map showing the location of the proposed site and surrounding landscape hazards and environment are created using a layout created within ArcIMS.

H12. SOCIAL WEATHER MAPS
Jason M. Siniscalchi, Chad D. Pierskalla, and Steven W. Selin, West Virginia University
Thomas E. Fish, NOAA Coastal Services Center

As timelines are shortened and information becomes more complex and dynamic, there is an increased need to provide, clear, concise, reliable, valid, and, ultimately, usable knowledge to facilitate expedient and informed decision making. This presentation suggests an alternative approach to visualizing socioeconomic data—a social weather map—that assimilates multiple socioeconomic indicators into one global index of socioeconomic change. We will present various applications of the social weather map approach. We will consider the role of social change in National Forest Plan Revision, including a validation of the method, its use to detect and further investigate social change, and benefits to both decision makers and the general public. Additionally, we will show how the social weather map method can be used to model indicators of change at the regional scale of the Great Lakes and at a more precise scale of individual communities and neighborhoods. Lastly, we will suggest alternative uses of the technique, including overlays with additional GIS layers and visualizing temporal change in social conditions.

CONFERENCE ADJOURNS
12:30 p.m.

Poster Presentations

Benthic Mapping

P01. MONITORING COASTAL FISH HABITAT IN NORTH CAROLINA – PURPOSE, CURRENT STATUS, AND FUTURE DIRECTIONS

Scott Chappell, Anne Deaton, Pete Mooreside, and Rodney Guajardo, North Carolina Division of Marine Fisheries

In response to mounting evidence of habitat and water quality degradation in coastal North Carolina, the State developed a Coastal Habitat Protection Plan (CHPP) for adoption by three environmental commissions in December 2004. The legislative goal of the CHPP is “long-term enhancement of coastal fisheries associated with coastal habitats.” The CHPP, a collaborative effort among natural resource agencies, scientists, and commissioners, includes recommendations for management and research. Geospatial data on coastal fish habitats and potential threats were incorporated into the CHPP to assess habitat status and trends. The CHPP process was initially described at the 2001 GeoTools conference. This presentation focuses on habitat mapping and monitoring in North Carolina – its role in fish habitat management, its current status, and CHPP recommendations for improvement.

Habitat mapping and monitoring provides baseline data and documents changes in fish habitat distribution and condition. However, varying levels of information are available for the six coastal fish habitats (wetlands, submerged aquatic vegetation, shell bottom, soft bottom, hard bottom, and water column) with wetlands having the most complete baseline data. Recommendations in the CHPP therefore stress completion of baseline habitat mapping in order to evaluate trends. Completion of baseline habitat mapping will also help to identify, designate, and protect “strategic habitat areas,” a classification scheme proposed in the CHPP to denote locations of exceptional fish habitats threatened by encroaching development. Such areas will be the focus of coordinated and enhanced monitoring of both threats and habitats.

P02. 3-D BENTHIC TERRAIN MAPPING AND MODELING IN AMERICAN SAMOA

Ronald W. Rinehart and Dawn Wright, Department of Geosciences at Oregon State University
Joshua Murphy, Perot Systems Government Services at NOAA Coastal Services Center
Lori Cary-Kothera, NOAA Coastal Services Center
Emily Lundblad, Joint Institute for Marine and Atmospheric Research, Coral Reef Ecosystem Division at NOAA Fisheries
Emily Larkin, Department of Geosciences at Oregon State University

Ongoing has been the development of a systematic and robust methodology by which acoustic multibeam bathymetric data can be transformed into a classified product that is useful for coastal and marine resource managers, scientists, and educators in American Samoa. GIS analyses for benthic terrain consider slope, aspect, rugosity, bathymetry, and bathymetric position index as factors. Based on this methodology, Oregon State University and the NOAA Coastal Services Center have developed the Benthic Terrain Modeler (BTM), a new ArcGIS 8.x extension. The BTM also incorporates a scalable classification dictionary that can be used to maintain consistency across multiple levels of a seafloor-mapping project. Included with the tool is a default classification schema that can be customized through one of the tool’s steps or through direct editing of the classification dictionary file, which is in the Extensible Mark-up Language (XML) format. The extension’s wizard interface educates and guides the user through a series of analysis steps, resulting in a classified terrain that may be suitable for tying to benthic species distributions for the preparation of habitat maps. This methodology has been used to produce some of the first benthic terrain maps and 3-D visualizations for several coastal locations in American Samoa, including the Fagatele Bay National Marine Sanctuary. Maps generated by the BTM have been further enhanced with data from towed-diver survey tracts and accuracy assessment points. Successful incorporation of these data sources will move beyond a purely geomorphological description of the benthoscape toward a biotic benthic community assemblage focused assessment.

P03. MAPPING PROCESS FOR CORAL HABITATS IN SOUTHEAST FLORIDA

Kevin A. Madley, Florida Fish and Wildlife Conservation Commission
Bernhard Riegl, National Coral Reef Institute, Nova Southeastern University

The Florida Fish and Wildlife Conservation Commission, the Florida Department of Environmental Protection, Nova Southeastern University, and NOAA have teamed up to develop, plan, and conduct an exercise designed to map coral reefs and other habitat of the Southeast Florida shelf reefs (Martin County south through northern Dade County). The principal outcome of this mapping exercise will be accurate and detailed geographic information system (GIS) map layers of coral reef biological and geological resources. Detailed bathymetric data (i.e., LADS) originally created in 2001 for the Broward County Shore Protection Project will serve as the base map for overlaying the results of the benthic mapping.

Habitat data has been collected using acoustic remote sensing equipment and software, capable of sea-floor classification based on the shape of echo returns. Two acoustic bottom classification systems were used: A Quester Tangent Corporation (QTC) VIEW Series V System (single frequency) and a Seatronics Group Echoplus System (dual frequency). Both systems use a suite of echo features and algorithms to describe raw data, which are then assigned to groupings using principle components analysis (PCA). The output of acoustic bottom mapping is a geo-referenced map with color-coded echo-classes. These echo-classes are being ground-truthed and interpreted by a more detailed geo-morphological and ecological analysis. Ground-truthing has involved DGPS stamped video and in situ SCUBA diving.

P04. A PROJECT METHODOLOGY FOR OYSTER HABITAT MAPPING

Gary R. Florence and David Loy, Photo Science, Inc.
Francois Smith, Earth Satellite Corporation
Mark Finkbeiner, NOAA Coastal Services Center
Bill Stevenson, I.M. Systems Group at the NOAA Coastal Services Center

Intertidal oysters (*Crassostrea virginica*) are dispersed throughout most of the cost of the State of South Carolina (SC). These oysters serve as an important economic and environmental resource to the state. SC Department of Natural Resources (NR) has contracted with Photo Science, Inc., a provider of professional geospatial services, to determine the location, extent, and condition of the intertidal oyster reefs throughout the state. Oyster reef areas are assigned to various categories of “strata.” Strata classes range from dead washed shell to dense live clusters with vertical relief. The state has used these strata to correlate expected yields and to manage commercial leases.

Due to the unique combination of spectral and spatial characteristics associated with oyster features, they are identifiable from remotely sensed imagery. The data source used for this project is airborne multi-spectral imagery acquired by GeoVantage Inc.’s GeoScanner system during the 2003 and 2004 oyster growing seasons. This system produced 4-band multi-spectral imagery in an

ERDAS Imagine *.img format. Image data was obtained with a 0.25 m2 spatial resolution (0.25 m x 0.25 m pixels) during negative low tide periods when the shellfish beds were exposed.

A combination of semi-automated feature extraction techniques and ground truth field verification are used by Photo Science to create a continuous data layer to determine three class distinctions of the Oyster strata. Visual Learning System's Feature Analyst Software is being successfully used by Photo Science to incorporate both spatial and spectral properties during the feature extraction process. This software has been effective to inventory and determine the health or condition of the oyster beds. The resultant shapefiles are committed directly to a Geodatabase utilizing Feature Analyst's Commit to Geodatabase tools.

Production methodology will be presented and spatial and thematic accuracies will be discussed.

P05. NEW METHODS IN DEVELOPING HIGH RESOLUTION MARINE BENTHIC HABITAT MAPS

Edward Saade and Doug Lockhart, Fugro Pelagos, Inc.
Gary Greene, Moss Landing Marine Lab

New processing methods developed by Fugro Pelagos, Inc. (FPI) of San Diego have greatly improved the ability to display textural characteristics of the seafloor. This poster illustrates how digital multibeam swath bathymetry and backscatter images can be used to produce the highest resolution possible for applications for developing marine benthic habitat maps. These techniques may resolve unique bottom structures such as structural geology, faulting, columnar basalts, sedimentary bedrock, glacial erosion, and other features that have been found to be important bottom fish habitats. Data examples of all of these features are shown.

Recent multibeam bathymetric mapping of the eastern Fairweather Ground of Alaska using proprietary "snippet" processing of backscatter data has provided the Alaska Department of Fish and Game a high resolution marine benthic habitat map that may refine the way rockfishes are managed in SE Alaska. FPI's unique usage of MBES backscatter processing software, RESON transducer beam pattern corrections, and leading edge data collection tools such as the APPLANIX True Heave motion correction technique result in the best possible data from the field. A flow diagram of data collection and processing is provided. This systematic approach ensures that the geographic location of the backscatter image is precisely co-located with the sounding data from the MBES, resulting in a true 3-Dimensional display of the seafloor and the substrate. Examples of these data products and their application are presented in this poster.

P06. MANAGING SEAFLOOR GROUND-TRUTH SURVEY DATA WITH ARCGIS

Ed Sweeney, U.S. Geological Survey, Woods Hole, MA
Seth Ackerman, Massachusetts Office of Coastal Zone Management, Woods Hole, MA
VeeAnn Cross, Brian Andrews, and Dann Blackwood, U.S. Geological Survey, Woods Hole, MA

A series of Ground-Truth Management (GTM) tools are currently under development for use with ESRI's ArcGIS in an effort to simplify and streamline the process of generating spatial data from seafloor video, photographs and surficial sediment data collected during ground-truth surveys. The U.S. Geological Survey's SEABed Observation and Sampling System (SEABOSS) and mini-SEABOSS are used to augment geophysical data such as side-scan-sonar and seismic reflection profiles. The SEABOSS system uses forward and down-looking video cameras and a high-resolution digital camera to record video and still photos of the seafloor in addition to a

Van Veen grab sampler to collect sediment samples within the upper half-meter of the seafloor. The SEABOSS is not independently navigated; however, all data collected at a sample site are referenced to time, and therefore are linked to the ship's navigation. After incorporating position information, spatially referenced data are generated. The current lengthy, multi-step process utilizes several programming scripts (Awk, Perl, Avenue, and Visual Basic) to reformat navigation output, sub-sample the navigation for the time intervals at each station, extract time from the JPG header of digital images, incorporate sediment grain-size analyses, and hotlink bottom photos ultimately creating ESRI shapefiles. The Ground-Truth Management (GTM) tools will simplify this process by establishing a series of user-friendly applications for use within ESRI ArcGIS© version 9.

P07. A GUIDE TO MAPPING THE DISTRIBUTION OF SEAGRASSES (*ZOSTERA* SPP.) IN PACIFIC NORTHWEST ESTUARIES USING FALSE-COLOR NEAR-INFRARED AERIAL PHOTOGRAPHY

David R. Young, U.S. Environmental Projection Agency, Office of Research and Development (ORD), National Health and Environmental Effects Research Lab (NHEERL), Western Ecology Division (WED), Pacific Coastal Ecology Branch (PCEB)
Patrick J. Clinton, Indus Corporation
David T. Specht, U.S. Environmental Projection Agency/ORD/NHEERL/WED/PCEB

Seagrasses are a critical component of Pacific Northwest (PNW) estuarine habitat. Scientists and managers need cost-effective methods for determining seagrass distributions over time in different classes of PNW estuaries. Aerial photomapping is one such technique. A protocol for conducting aerial photographic surveys of nearshore habitats using true color (TC) film, based on experience from the Southeastern and Gulf coasts of the U.S., has already been developed. However, there are substantial tidal range differences between estuaries in those regions (minimal) and in the Pacific Northwest (significant). Here we describe an alternate approach to producing aerial photo-based maps of eelgrass (*Zostera marina*) distributions allowed by the large intertidal range within PNW estuaries. This condition provides an opportunity to conduct aerial photographic surveys using false-color near-infrared (color infrared, CIR) film; low spring tides expose intertidal seagrass habitats, so that high absorption of near-infrared radiation by covering water is not a limitation. Classification of the resulting images of exposed intertidal vegetation was found to be superior to that obtained using true color film. Issues that need to be considered in planning and executing a CIR aerial photographic survey of intertidal and near-subtidal seagrass distributions are discussed. Approaches to the orthorectification and classification of the photographs to produce digital photomaps also are provided. Corroborative information on eelgrass intertidal distributions from ground surveys within one PNW estuary is presented.

P08. HABITAT SUITABILITY MODELING AND MAPPING THAT RELATE CHANGES IN FRESHWATER INFLOW TO SPECIES' DISTRIBUTIONS IN ROOKERY BAY, FLORIDA

Peter J. Rubec and Jesse Lewis, Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute
Michael A. Shirley, Florida Department of Environmental Protection, Rookery Bay National Estuarine Research Reserve
Stanley Locker, College Of Marine Science, University of South Florida

We conducted this study to assess the influence of changes in freshwater inflow on estuarine species distributions and relative abundance in Rookery Bay, Florida. Originally, freshwater entered the bay via sheet-flow. In the 1960s, creation of a canal system, which funnels water through a weir situated on Henderson Creek, altered inflows. To assess the impact of these

changes, we initiated monitoring in Rookery Bay and in Fakahatchee Bay. The latter estuary served as a control, since it still has natural sheet-flow.

Bottom types and bathymetry in Rookery Bay were mapped using side-scan and QTC View sonar systems. Bottom types were verified by analyses of bottom grab and core samples. Salinity, temperature, and dissolved oxygen data collected seasonally in the two estuaries were interpolated to map water-column habitats.

Since Rookery Bay lacks long-term fisheries-independent monitoring (FIM), we analyzed FIM data collected in Charlotte Harbor to determine habitat affinities for 22 life stages of 11 species of fish and macro-invertebrates. Suitability functions were derived by fitting splines to catch rate (CPUE) data across environmental gradients, and by calculating mean CPUEs within bottom type categories. Abundance indices transferred from Charlotte Harbor were applied to Rookery Bay habitat layers to conduct raster-based habitat suitability modeling (HSM) during a dry season (spring) and a wet season (summer) in Rookery Bay. Predicted HSM maps depict suitability zones (low to optimum) across the estuary. The models were validated by calculating mean observed CPUEs (from monthly trawl sampling) within the predicted zones. Increasing mean observed CPUEs across the zones indicated the models correctly predicted the spatial distributions of species' life stages. The study assessed changes in species distributions in relation to changes in salinity patterns in the estuary. The study was funded through a grant from the Big Cypress Basin Board of the South Florida Water Management District.

P09. DELINEATING OYSTER REEFS USING AIRBORNE MULTI-SPECTRAL IMAGERY: ASSESSING THE ACCURACY OF EXTRACTION TECHNIQUES USING GROUND-TRUTHING AND RELATED APPROACHES

Kristin Schulte, Mike Yianopoulos, Margaret Vo, Loren D. Coen, Robert Van Dolah, and William Anderson, South Carolina Department of Natural Resources, Marine Resources Division
Mark Finkbeiner, NOAA Coastal Services Center
Bill Stevenson, I.M. Systems Group at the NOAA Coastal Services Center

The South Carolina Department of Natural Resources (SCDNR) is currently undertaking a statewide assessment of its oyster resources as part of a multi-year, collaborative effort with NOAA's Coastal Services Center. SCDNR and NOAA's Coastal Services Center staff developed a method for evaluating the results of airborne multi-spectral digital imagery acquired by GeoVantage Inc.'s GeoScanner system. Visual Learning System's Feature AnalystTM software is being used by PhotoScience to derive results including location, extent, and condition of intertidal oyster populations along intertidal areas of the South Carolina coast. Field assessments are being conducted in order to ground-truth these results and assist in development of Feature Analyst extraction techniques. Ground-truthing efforts are being conducted by two teams (each with two dedicated personnel) using shallow draft boats at or near MLW +/- 2.0 hours. In order to facilitate field assessments of oyster bed delineations and bed "quality," SCDNR teams are utilizing the newly-created, high-resolution imagery, along with U.S. Geological Survey topographic maps, digital orthophoto quarter quads (DOQQ), and historic DNR shellfish surveys from the 1980s. Field efforts utilize Trimble Pathfinder Pro XR and XRSTM surveying units coordinated with real-time Digital8® video of bed footprints. The use of these instruments in concert allows ground-truth efforts to be accomplished efficiently and to determine the approximate perimeter boundaries of defined beds using the surveying equipment. GPS data are collected as linear representations (transects) of intertidal oyster populations. Oyster density, reef size (or footprint) and location data are also entered into a defined data dictionary. Video is post-processed to determine estimates

of percent vertical oyster coverage in defined time segments, and to define bed quality. The post-processed imagery received from the vendor are then validated to identify the number of beds that are correctly and incorrectly identified.

Fisheries and Protected Species Management

P10. THE FINBASE MAPPING TOOL: A CUSTOM ARCGIS EXTENSION TO FACILITATE THE VISUALIZATION OF BOTTLENOSE DOLPHIN PHOTO-IDENTIFICATION DATA

Jeffrey D. Adams, Lori Schwacke, Todd Speakman, and Eric Zolman, NOAA Ocean Service, National Centers for Coastal Ocean Science, Center for Coastal Environmental Health and Biomedical Research

An important facet of dolphin photo-identification research is the examination of spatial relationships between individual animals and the environment. These spatial relationships help researchers to assess distribution, home range, core use areas, abundance and density estimates, habitat usage, and community structure. Visualization of dolphin sighting data can play a vital role in the identification and communication of these spatial relationships. To support ongoing photo-identification research in our laboratory, we developed a custom Microsoft Access© database (*FinBase*) to store and manage textual and numerical data from photo-identification surveys, as well as provide image management and analysis functionality. To facilitate the visualization of data stored in *FinBase*, we developed a companion ArcGIS™ Extension called the *FinBase Mapping Tool*. The *FinBase Mapping Tool* allows users with little to no background in GIS or relational databases to query the photo-identification database from within ArcMap using simple, point-and-click controls and then display the results spatially. The queries can be based on a variety of the collected and stored parameters, including: survey and sighting number, survey area, date, dolphin ID, environmental conditions (e.g. depth, salinity, tide), group size estimates, dolphin behaviors (e.g. feeding, socializing, traveling), sighting observations (e.g. group cohesiveness, presence of shrimp boats), or individual fin attributes (e.g., chopped fin, fluke scar/notch, fin scar). The FinBase Mapping Tool facilitates data exploration and interaction and allows researchers more time to develop informed research questions.

P11. OBIS-SEAMAP: DEVELOPING ONLINE TOOLS FOR BIOGEOGRAPHIC RESEARCH AND CONSERVATION OF MARINE MAMMALS, SEA BIRDS AND SEA TURTLES

Patrick Halpin, Geospatial Analysis Program, Duke University
Andy Read and Larry Crowder, Duke University Marine Lab
Ben Best and Michael Coyne, Geospatial Analysis Program, Duke University
David Hyrenbach and Sloan Freeman, Duke University Marine Lab

In this presentation, we describe the Spatial Ecological Analysis of Marine Megavertebrate Populations (SEAMAP) program, a node of the Ocean Biogeographic Information System (OBIS) and a component of the Census of Marine Life. OBIS-SEAMAP (http://seamap.env.duke.edu/) is a digital database of geo-referenced marine mammal, seabird and sea turtle distribution and abundance data to augment the understanding of the ecology of these megavertebrates by: (1) facilitating the study of potential impacts on threatened species; (2) enhancing our ability to test hypotheses about biogeographic and biodiversity models, and (3) supporting modeling efforts to predict distributional changes in response to environmental change. To enhance the research and educational applications of this publicly available database, OBIS-SEAMAP provides a broad array of products (e.g., tabular data, maps and explicit meta-data) and services (e.g., web-based query, visualization and analysis tools). OBIS-SEAMAP provides managers with the ability to place the habits and habitats of marine megavertebrates in an oceanographic context, which is

essential to design effective conservation measures. The OBIS-SEAMAP information system integrates data from disparate perspectives (e.g., movement data, vessel-based surveys, remote sensing information) required to analyze design fisheries bycatch mitigation measures, such as time-area closures and marine protected areas. Additionally, OBIS-SEAMAP provides educational products and analytical tools geared toward a broad audience of educators and students. The primary challenge to the success of this project is to stimulate the collaboration of diverse scientists, research institutions, and stakeholders. To encourage such collaboration, tools are being developed specifically for the large spatial scales over which these highly migratory species operate. The integration of disparate data sets with tools that provide a large-scale oceanographic context will enhance our ability to design effective conservation measures for these organisms.

P12. DATA ISSUES IN CREATING OPEN/CLOSED AREAS IN THE ALEUTIAN ISLANDS BOTTOM TRAWL FISHERIES

John Olson, NOAA Fisheries, Alaska Region

The National Marine Fisheries Service (NMFS)–Alaska Region has completed a Draft Environmental Impact Statement (DEIS) which evaluates alternatives and environmental consequences for its Fishery Management Plans as required by the Magnuson-Stevens Fishery Management and Conservation Act. This DEIS includes a component fulfilling the requirement to minimize to the extent practicable the adverse effects of Council-managed fishing on Essential Fish Habitat.

In an attempt to provide an alternative to mitigate the effects of fishing activities on sea floor habitats, Oceana proposed using catch-per-unit-effort data to delineate the extent of the fisheries in the Aleutian Islands. A GIS analysis was performed with confidential fisheries observer data and presented to the North Pacific Fishery Management Council (NPFMC) in 2003. The Aleutian Island bottom trawl fishery representatives felt that the use of CPUE to delineate open/closed areas did not accurately represent their fishery, however, and proposed an alternative method to the NPFMC in June of 2004.

Aleutian Island bottom trawl fishery representatives suggested that utilizing cumulative catch over a period of years would provide a more accurate description of the fishery. This proposal was analyzed by NMFS using a minimum threshold of 200 metric tons of catch and the results were presented to the NPFMC in October 2004. Several problems with the observer data and its utility in this type of analysis were discovered. A collaborative industry/NMFS effort is now underway which will utilize highly proprietary and confidential individual vessel plotter tow tracks to delineate an accurate fishery footprint. This process is presented to illustrate issues regarding the use of fisheries observer data to delineate open/closed areas in the Aleutian Islands.

Coastal Mapping and Shoreline Change

P13. THE DIGITAL SHORELINE ANALYSIS SYSTEM (DSAS): AN ARCGIS© EXTENSION FOR CALCULATING HISTORIC SHORELINE CHANGE

Emily A. Himmelstoss, E. Robert Thieler, and Tara L. Miller, U.S. Geological Survey
Daniel Martin, Ayhan Ergul, Amar Das, and Michael Thompson, Perot Systems Government Services, Environmental Services Group, Scituate, MA

The Digital Shoreline Analysis System (DSAS) is a software extension to ESRI ArcGIS© that enables a user to calculate shoreline rate-of-change statistics from multiple historic shoreline positions. A user-friendly interface of simple buttons and menus guides the user through the major steps of shoreline change analysis. Components of the extension include: 1) instruction on the proper way to define a reference baseline for measurements; 2) automated and manual generation of measurement transects with user-specified parameters; and 3) output of calculated rates of shoreline change and other statistical information. DSAS computes shoreline rate-of-change using simple linear regression, weighted least squares regression, endpoint rate, average of endpoints and jackknife iterative regression techniques. The standard error, correlation coefficient, and confidence interval are also computed for the simple and weighted least squares methods. All output data are written to the attribute table associated with each transect. DSAS is intended to facilitate the shoreline change calculation process, providing both rate-of-change information and the statistical data necessary to establish the reliability of the calculated results. DSAS was developed by the U.S. Geological Survey with programming assistance from Perot Systems© and can be downloaded from http://woodshole.er.usgs.gov/project-pages/dsas/.

P14. MULTI-TEMPORAL DIGITAL ELEVATION MODELS OF THE LARGEST EAST COAST SAN DUNE: JOCKEY'S RIDGE, NORTH CAROLINA

Helena Mitasova, North Carolina State University
David J. Bernstein and Christopher W. Freeman, Geodynamics: Geologic and Oceanographic Services
Margery Overton, North Carolina State University
Russell S. Harmon, Army Research Office, Army Research Laboratory

Geographic Information Systems (GIS), along with modern mapping technologies such as Real Time Kinematic GPS and LIDAR, allow us to perform rapid surveys, integrate data from various sources and times, and analyze them to gain better understanding of evolution of coastal topography. Two different lidar surveys – 1999 NOAA/USGS/NASA and 2001 NC Floodplain mapping – were combined with 2004 RTK-GPS data to produce a multi-temporal set of high resolution (1m) DEMS of the Jockey's Ridge dune field and quantify its spatial pattern of short term topographic change. Accuracy of the data was assessed using a stable paved area, with RTK-GPS and 1999 lidar data within less than 10 cm RMSE, while the 2001 NC Floodplain data exhibited approximately 25 cm bias. After the bias was removed, RMSE between all 3 data sets was less than 10cm on the paved road. Analysis of topographic change revealed acceleration of the main dune deflation while its horizontal migration has been significantly reduced by a newly formed slip face. At the same time, horizontal migration of the East and South dunes continued at a rapid rate threatening the existing roads and homes on the southern edge of the park. Understanding the causes of the current movements can point to potential solutions and suggest new perspectives on management of the dune as an attraction and as a recreation site.

P15. COASTAL ZONE MAPPING FROM RADARSAT AND OPTICAL IMAGES: SHORELINE EXTRACTION, SUBMERGED VEGETATION AND BIOPHYSICAL ELEMENTS MAPPING

Sylvain Deslandes and Bronislaw Popiela, Geomat International, Inc.
Marc Pelletier and Jean Lavoie, Procéan Environment, Inc.

Geomat international, a well established company in geomatics and remote sensing, and Procean Environment, a firm specialized in environmental management projects in the aquatic domain, have collaborated in the development of commercial tools for radarsat-i imagery for coastal zone management.

The project focused on the evaluation of the potential use of radarsat-i and ii images for shoreline mapping, especially on the selection of the best acquisition parameters as well as the optimal polarization configurations using radarsat-ii simulated images. Several shoreline extraction tools were used. Those included object-oriented segmentation and various region growing algorithms. Automatic vectorization and smoothing procedures have been developed to meet the cartographic standards for both federal and provincial mapping agencies.
Radarsat-i fine beam mode images have been acquired over the Manicouagan Peninsula and the Montmagny areas in the St. Lawrence estuary in August 2003 coinciding with high tide events. A total of 240 landmark features at the water/land limit have been located in the field by GPS survey methods to validate the shoreline vectors extracted from the acquired images. Results showed that the different approaches have lead to an accuracy range of 5.6 to 10 m.

At present, the project is focusing on the evaluation of the potential use of both radar and optical images for the identification and analysis of biophysical elements in coastal zones. Salt marshes and *Zostera marina* are been studied using radarsat-1, aster and ikonos images. Based on a field survey during summer 2004, *Zostera marina* has been mapped successfully from optical images. Some biophysical elements from salt marshes have also been identified using radarsat-2 simulated images and radarsat-1 tide synchronized images.

P16. INTEGRATION OF CONTINUOUS RESISTIVITY PROFILING AND SEISMIC-REFLECTION DATA IN THE NEARSHORE ENVIRONMENT

VeeAnn A. Cross, David S. Foster, and John F. Bratton, U.S. Geological Survey, Woods Hole, MA

Groundwater discharging to bays and estuaries is of concern because it often contains elevated concentrations of nutrients and other pollutants that affect coastal ecosystems. Saltwater intruding into coastal aquifers due to excessive pumping has also affected water supplies of coastal communities. Commonly underrepresented in groundwater studies is the understanding of the geometry and stratigraphic control of groundwater flow systems beneath coastal water bodies. This issue is addressed with the use of continuous resistivity profiling (CRP) and seismic-reflection data. The CRP system was used to map the freshwater-saltwater interface in the sub-seafloor environment of outer Cape Cod, Massachusetts. An AGI SuperSting Marine system was used, which consisted of a DC power source, an electrode streamer cable, a GPS receiver, a fathometer, and shipboard logging software. Collected data were processed with an inversion program, AGI EarthImager 2D. Using a combination of GIS software packages, including ArcGIS (ESRI) and EarthVision (Dynamic Graphics), these processed data were integrated with subsurface geology as interpreted from results of previous seismic-reflection surveys and onshore drilling. This data integration resulted in a 3D representation of the groundwater system where its relationship to the subsurface geology in the sub-aqueous environment, including confining units and preferential flow conduits, can be examined in greater detail. This approach can be applied to other marine/estuarine areas to characterize groundwater flow in the nearshore environment.

P17. TIME-SERIES DELTA CHANGES AT LAKES ENTRANCE, VICTORIA, AUSTRALIA (1889-2004): CORRELATION WITH CATCHMENT MANAGEMENT EVENTS

James A. Peterson and Peter J. Wheeler, Monash University, Victoria, Australia

From analysis of time-series bathymetric data through digital spatial modelling, the nature of change in the relative significance of the ebb and flood-tide deltas at the artificially engineered entrance to the Gippsland Lakes (Victoria, Australia) can be quantified and also visualised. From spatial querying and modelling, it is argued that: (a) with over 100 years of bathymetric change record, coupled with an extensive hydrological data archive for the contributing catchment, there is much scope for data integration; (b) the flood tidal deposition greatly increased after inter-regional water transfer was initiated; (c) major depositional areas within the study area can be readily identified via digital bathymetric model visualisations; (d) dredging operations might be better monitored and managed through deployment of digital bathymetric models for visualisation; (e) if such visualisation is adopted, the bathymetric data collection should include both the flood and ebb-tidal deltas, and (f) the time-series spatial models offer visualisation of time-series historical bathymetric changes in ways that all stakeholders can relate to, during public participation in the planning process.

P18. SHORE EVOLUTION ALONG CHESAPEAKE BAY SINCE 1937

C. Scott Hardaway, Jr., Donna A. Milligan, and Christine A. Wilcox, Shoreline Studies Program, Virginia Institute of Marine Science, College of William & Mary

Shoreline evolution is the change in shore position through time. The shore line is commonly plotted and measured to provide a rate of change, but it is as important to understand the geomorphic patterns of change when determining the impact of the hydrodynamic and aerodynamic processes on a particular stretch of coast. This type of shore analysis provides the basis to know how a particular coast has changed through time and how it might proceed in the future. Documenting and measuring how the Bay shore has evolved since 1937 is now possible through orthorectification of historical and recent aerial imagery. Aerial imagery shows how the geomorphology of the coast has changed, how beaches, dunes, bars and spits have grown or decayed, how barriers have breached, how inlets have changed course and how one shore type has displaced another, or has not changed at all. Shore change is a natural process but, quite often, the impacts of man, through shore hardening and/or inlet modification, will come to dominate a given shore reach. Utilizing aerial imagery of Mathews County, Virginia taken in 1937, 1953, 1968, 1982, 1994, and 2002, we will demonstrate the process we have used to analyze the geomorphic change along its Chesapeake Bay shoreline and quantify rates of change in many Virginia localities.

P19. PRESERVING HISTORIC DATA FOR THE GULF ICW AND ADJOINING WATERS OF SW FLORIDA AND SERVING IT TO THE COMMUNITY

David Fann, Florida Sea Grant, University of Florida
Joseph Aufmuth, George A. Smathers Libraries, University of Florida

During more than a decade of projects involving southwest Florida coastal waters, Florida Sea Grant (FSG) has archived abundant historical spatial data, including aerial photography prints and maps. The collection previously included 18 already-georeferenced USC&GS topographic maps (T-sheets), 29 T-sheets scanned by NOS, and 22 ACOE survey maps. A NOAA Coastal Services Center initiative to preserve coastal data and make it available on-line enabled FSG to scan digitize 657 aerial photographs and 67 USC&GS hydrographic maps (H-sheets) and to rectify 440 images.

This poster discusses and illustrates the techniques and software used to rectify the images with positional accuracy sufficient for many applications and to distribute the images over the Web. The aerial photographs, which predate much of SW Florida's intense development, contain few persistent, distinctive features suitable as georeferencing ground control points (GCP). Besides identifying GCPs, the process created preliminary Geographic Information Systems (GIS) index map shapefiles, used for project tracking and data distribution by an Internet Map Server (IMS), as well as FGDC-compliant metadata.

The data archive is housed and distributed in cooperation with the University of Florida (UF) Libraries and the Florida Center for Library Automation (FCLA). In order to distribute the data the UF Library transformed the data locations to be compatible with the Florida Department of Environmental Protection's (FDEP) GIS base map data, and created a point feature and relational database amenable to IMS query and display. Data distribution is via a Web server, IMS software, and a relational database link to FSG data stored at FCLA.

Data Sharing

P20. METADATA AT NOAA's NATIONAL GEOPHYSICAL DATA CENTER
Karen Horan and Ted Habermann, NOAA National Data Centers

NOAA's National Geophysical Data Center (NGDC) provides scientific stewardship, products, and services for geophysical data describing the sea floor, solid earth, and solar-terrestrial environment, including Earth observations from space. Metadata is a critical element of this mission. The Data Center's goal is to support the specific needs of our data managers and users while conforming to national and international metadata standards and minimizing the number and complexity of technology systems. Many times, the elements of this goal conflict with one another and questions are raised. For example: Should products have metadata records or only the datasets they are derived from? How should the one dataset / multiple products case be handled? What if the products (for example CD-ROMs) contain different spatial/temporal subsets of the dataset? What is the relationship between metadata and product catalogs? Can metadata be used for tracking new data or additions to current datasets?

We will present examples some of these questions and discuss our approach to addressing them.

P21. THE CALIFORNIA COASTAL OCEAN GEODATABASE (CCOG)
Will McClintock and Brian Kinlan, Maine Science Institute, University of California, Santa Barbara

The California Marine Life Protection Act (MLPA) calls for establishment of a statewide network of Marine Protected Areas (MPAs) designed and managed based on sound conservation based principles. Placement of MPAs to maximize long term conservation benefits requires detailed knowledge of the spatial and temporal structure of biotic and abiotic features of the marine environment. Much of the information needed to develop a comprehensive classification of the California nearshore marine environment has already been collected, but remains in widely dispersed, inaccessible formats (e.g. paper maps, satellite imagery, aerial photos, reports). There is urgent need for a coordinated effort to organize and synthesize these data in a common, online, digital format.

To this end, we have created the integrated California Coastal Ocean Geodatabase (CCOG). We are synthesizing data on the spatial distribution and temporal dynamics of nearshore marine resources in a geodatabase that interactively serves data to the public, MLPA regional working groups, the California Department of Fish & Game, and institutional researchers. Rather than merely compiling data, we are applying statistical data assimilation techniques to integrate diverse datasets in a manner that maximizes information extracted from multi-source data, allows quantitative estimation of spatial uncertainty, facilitates interpretation by experts and non-experts alike, and interfaces directly with MPA site selection algorithms.

P22. EVALUATING DATA MODELS AND RELATED GIS TOOLS FOR MARINE AND ATMOSPHERIC APPLICATIONS
Joe Breman, Environmental Systems Research Institute
Dawn Wright, Oregon State University

Data model initiatives have emerged in recent years as a means of organizing data sets relevant to Marine research and development. Both Atmospheric and Marine data models have been developed that address the complexity of multi dimensional data that vary in temporal and spatial reference. The dialog between organizations and individuals within the atmospheric and marine science communities regarding data representation issues is reflected in the current status of these models, and their implementation in the form of case studies, and project work has confirmed the utility of this approach.

The management of temporal data, using vector and raster tools for query and analysis are areas of primary focus. Feedback from NOAA, NCAR, UCAR, and other organizations have contributed to the design of new tools for temporal analysis of atmospheric and marine data sets not native to GIS, such as NetCDF and HDF. We are interested in continuing the process of data model design, and discovery of the most effective methods for interoperable data exchange for Marine and Atmospheric data types and formats.

A layer stack representation of the most commonly used Atmospheric and Marine data is an important stage in the design process. The data model template has been revised and is now being used to model atmospheric and marine data. Milestones in the data model process are made available via the internet and publications. Contributing ideas help to target development of new tools for the representation of data that varies temporally in time duration, and series, as well as spatially in the vertical extent both on the coast and in the water column.

Habitat Restoration

P23. THE APPLICATIONS OF GIS FOR ASSESSMENT AND DELINEATION OF OREGON'S EXISTING AND POTENTIAL TIDAL WETLANDS
Russell Scranton, Oregon State University

This project created a Geodatabase of existing and potential tidal wetlands at a scale of 1:1,000 for use by federal, regional and local resource managers for assessment of existing habitat and restoration potential for Oregon's Coastal Watersheds. A new delineation of tidal wetlands was interpreted using the existing National Wetland Inventory, Oregon's Estuary Plan Book's habitat maps, field work, digital orthoquads, color infrared and natural color aerial photos for the development of the Oregon Coastal Tidal Wetland Hydrogeomorphic Assessment for the EPA, Oregon's Department of State Lands and regional watershed councils.

The assessment of ecological integrity will be assessed for existing tidal wetland based on 13 ecological attributes of tidal marsh functions. This will help managers track changes in estuary tidal marsh health and aid in restoration management, giving managers a baseline of information for regional comparisons of restoration and enhancement projects. This data set also mapped Restoration Consideration Areas for restoration of tidal functions. This data set can be developed further to prioritization restoration efforts on a statewide and local level. The project compares each watershed's existing habitat classes, habitat alterations and potential for restoration. A comparison was also made to the Oregon State of the Environment Report 2000. The results show significant

gains in habitat since the 1970's with significant alteration since 1870. This data set has also been used by NOAA for assessment of Endangered Species Act critical habitat for the endangered Coastal Coho.

The data set has been distributed in three formats: maps, DVD's and through a geospatial data clearinghouse. Hard copy maps can be used for a general assessment of spatial density and fragmentation of existing habitat to aid in restoration prioritization. The Geodatabase data set, the master's project paper and a PowerPoint presentation have been placed on the Oregon Coastal Atlas for distribution to the public.

P24. HUDSON-RARITAN ESTUARY ECOSYSTEM RESTORATION PROJECT, DEVELOPMENT OF CONCEPTUAL RESTORATION PLANS FOR 11 REPRESENTATIVE SITES

C.C. Miller, Barry A. Vittor & Associates, Inc.
F.A. McCullough, Sustainable Science LLC
R.J. Will, U.S. Army Corps of Engineers

The Hudson-Raritan Estuary Ecosystem Restoration Project was established to develop conceptual habitat restoration plans for 11 representative sites selected in the Hudson-Raritan Estuary Ecosystem. The restoration goals and objectives were to return the individual sites to a less degraded historical condition. The restored habitat types included shallow water, intertidal flats, salt marsh, coastal scrub-shrub, grassland, and maritime forest communities. The 11 sites included: Rahway River (Union & Middlesex Counties, NJ), Marquis Creek (Raritan Bay, NJ), Leonardo (Sandy Hook Bay, NJ), Pelham Lagoon/Turtle Cove (Pelham Bay Park, NY), Tallapoosa Creek (Pelham Bay Park, NY), Sherman Creek (Harlem River, NY), Alley Pond Park (Little Neck Bay, NY), Newtown Creek (East River, NY), Brookville Marshes (Jamaica Bay, NY), Dreier-Offerman Park (Gravesend Bay, NY), Old Place Creek (Arthur Kill, NY).

Conceptual plans for each of the 11 selected sites were created using GIS, along with spatial and temporal analysis of historical and existing data. The preliminary step in this process involved the use historical coastal surveys, and other historic maps of each site that were examined for their value in determining habitat type and, if possible, estimated hindcast functional value that previously existed at each site. These maps/aerial photographs were used to define habitat conditions at sites at different points in time. This process revealed the land disturbance trends and defined predisturbed habitat types and areas to restore. Surrounding land setting and regulatory constraints then guided the final restoration approach for each site.

P25. USING A GIS APPLICATION TO INTEGRATE BIOLOGICAL CONTROL INTO THE INTEGRATED WEED MANAGEMENT PROGRAM FOR *SPARTINA ALTERNIFLORA* IN WILLAPA BAY, WASHINGTON

Miranda Wecker, University of Washington, Olympic Natural Resources Center

Willapa Bay is one of the most productive and highest quality estuaries remaining in the United States. A key fueling stop for migrating birds in the Pacific Flyway, it supports an abundance of marine species. Willapa Bay is also the site of the most extensive infestation of smooth cordgrass—*Spartina alterniflora*—in the region. Roughly 32% of the total 47,000 acres of intertidal habitat are infested. More than half of the Bay's mudflats are broken into approximately 500 private ownerships, while the rest is under federal or state jurisdiction. In 1994, government agencies launched an integrated weed management program. The toolkit of approved methods is limited to one herbicide, glyphosate, and various mechanical methods. University of Washington Olympic Natural Resources Center and its partners added biological control in 2000 when *Prokelisia marginata* was released. Prior greenhouse trials had shown that certain plants would be resistant to *Prokelisia* and therefore would have to be targeted for eradication with other tools. To target resistant plants, sophisticated and precise integration of control applications is necessary. The challenges of integration in this case are legion. Four state and federal agencies have overlapping jurisdictions. Hundreds of private citizens own infested lands. The options for control vary in cost, sensitivity, and efficacy. The weed is spreading at different rates in different areas of the Bay. In the past 3 years, UW-ONRC has developed a geographic information system (GIS) application specifically designed to aid in *Spartina* management. My presentation will describe this software and its utility in integrated planning.

Internet Mapping and Information Technology for Managers

P26. STUFFING THE MANAGEMENT TOOLBOX: BENEFITS AND CHALLENGES TO INTEGRATING GIS INTO MASTERS OF PUBLIC ADMINISTRATION DEGREE PROGRAMS

Amy Blizzard, AICP, University of North Carolina at Wilmington.

This paper addresses the concept and process of using GIS as a teaching tool in coastal management and public administration curricula. Incorporating GIS into a Master of Public Administration (MPA) degree is new to many university programs. Here, the focus is not "how" but "why" GIS can be used by managers. In an MPA program, GIS can be an important component of the curriculum by offering a powerful tool to aid in management and decision-making. This paper highlights coursework in the MPA degree in the Department of Political Science at the University of North Carolina at Wilmington (UNCW). The UNCW MPA program responded to student requests for classes that integrate GIS and other technology into management coursework by creating a new class that applies management concepts to hands-on, project oriented training. In addition, this program uses case studies and projects that focus on issues and data found in the coastal environment so students can enhance their degree specialties (one degree track offered is Coastal Town Management). Students are also introduced to concepts of integrated technology by providing course work on developing useful public-sector websites, public information issues, and trends in GIS applications for the coastal environment and public administration. This paper describes a how this new program is meeting the demands for more technology-based curricula for its graduate students, what challenges exist in teaching GIS to management students with very little technical training, and why this approach is so rewarding for future coastal/public sector managers.

P27. DESKTOP AND INTRANET GIS APPLICATIONS FOR COASTAL RESOURCE MANAGEMENT: THE CONNECTICUT EXPERIENCE

Kevin O'Brien, Office of Long Island Sound Programs, Connecticut Department of Environmental Protection (CT DEP)
Howie Sternberg, Environmental and Geographic Information Center, CT DEP

In the mid-1990's the Connecticut Department of Environmental Protection (CT DEP) Office of Long Island Sound Programs (OLISP), in conjunction with the CT DEP's Environmental and Geographic Information Center (EGIC), began deploying desktop-based GIS technology to provide more efficient ways for staff to access and use information vital to coastal resource management decisions.

The result of this effort was the creation of the Coastal Resources GIS. Based on Environmental Systems Research Institute's (ESRI) ArcView 3.x system, the Coastal Resources GIS is a customized project that enables OLISP staff, most of whom have no formal GIS background or experience, to quickly and easily use the power of GIS tools and data to assist in making sound resource management decisions.

In 2000 EGIC upgraded the DEP's GIS capabilities by providing a means for all staff to access State-wide GIS data sets in a web-based format called Environmental Conditions Online (ECO). Taking a cue from the Coastal Resources project, ECO is an ESRI ArcIMS-based intranet application that provides a quick and easy way for novice users to access GIS data and tools via their desktop web-browsers.

This presentation will highlight some of the major functionalities of each platform, discuss some of the technology, design, and deployment issues unique to each, and conclude with ideas in the works for moving forward with GIS analysis for Connecticut's coastal resource management needs.

P28. NORTHWESTERN HAWAIIAN ISLANDS SPATIAL BIBLIOGRAPHIC GIS: A SCIENCE PLANNING TOOL

Susan Vogt and Christine Taylor, NOAA National Marine Sanctuary Program

The Northwestern Hawaiian Islands Spatial Bibliography (NWHI-SB) is a science planning tool that will help NOAA and partners to plan for future research and project investments in the Northwestern Hawaiian Islands. The main purpose of this tool is to provide text reference and/or spatial metadata on NWHI research using either spatial-area or keyword searches so that scientists may reduce duplicative research, prioritize their efforts, and identify obvious research partnerships in the NWHI region. The NWHI-SB includes a suitable base map of the Northwestern Hawaiian Islands and spatial locations of key characterization information (e.g., published studies, gray literature, and geographic metadata.) Users can simply conduct basic text queries, or define an area of interest on a map using a computer mouse. It is expected that Users will be able to update the database by submitting their own data and metadata information to the system administrator as well as receive updates to the system via the Internet.

P29. DEVELOPMENT OF A GEOGRAPHIC INFORMATION SYSTEM AS A MANAGEMENT TOOL TO REDUCE BYCATCH OF SEA TURTLES IN U.S. ATLANTIC OCEAN AND GULF OF MEXICO FISHERIES

Barbara A. Schroeder, NOAA Fisheries
Connie Y. Moy, RGII Technologies at the NOAA National Centers for Coastal Ocean Science
John D. Christensen, NOAA National Centers for Coastal Ocean Science
Ellen Keane, NOAA Fisheries
Michael S. Coyne, Duke University

All species of sea turtles inhabiting the Atlantic Ocean and Gulf of Mexico are listed as either endangered or threatened under the Endangered Species Act (ESA). Incidental capture in fishing gear is a major limiting factor in the recovery of sea turtles in these areas.

NOAA Fisheries, the agency responsible for protecting sea turtles in the marine environment, continues to implement conservation and monitoring programs, regulations, and other actions under the ESA to recover these species. To further help meet ESA recovery goals for sea turtles, NOAA Fisheries is implementing the Strategy for Sea Turtle Conservation and Recovery in

Relation to Atlantic Ocean and Gulf of Mexico Fisheries (Strategy). The Strategy is a new approach to reducing incidental capture of sea turtles in United States commercial and recreational fisheries based on evaluating sea turtle bycatch across gear types.

A key element of the Strategy is the development of a geographic information system (GIS) as a management tool to facilitate implementation of the Strategy. The GIS will integrate fishing effort, known sea turtle distribution, observed sea turtle bycatch, existing regulations with relevance to sea turtle bycatch, and relevant oceanographic features. This will be the first comprehensive GIS management tool dedicated to addressing the problem of sea turtle bycatch in the United States Atlantic Ocean and Gulf of Mexico region. Currently, the development of the GIS is ongoing and the target date for completion of the initial product is mid-2005.

P30. MAPPING AND CHARACTERIZING RECREATIONAL BOATING PATTERNS IN TAMPA AND SARASOTA BAYS, FLORIDA FOR MARINE RESOURCE MANAGEMENT

Charles Sidman, Florida Sea Grant
Bill Sargent, Fish and Wildlife Conservation Commission, Florida Wildlife Research Institute

Boating is a key element in Florida's coastal lifestyle and a major contributor to the state's population growth. Florida is the number one destination for marine recreation including saltwater boating with an estimated 4.3 million participants in the United States. Florida ranks third in the nation in recreational boat registrations—one boat for every 17 residents. As the quantity of boats that ply coastal waterways increases, so does the need for improved waterway access and maintenance, greater public safety, improved boater education, and enhanced resource management. Lack of adequate information has hindered local efforts to plan for recreational boating. This paper reports on a project to map and characterize spatial patterns of coastal recreational boating within a geographic information system (GIS).

We mailed a map-based questionnaire to a random sample of 6,500 boaters that actively use the Tampa and Sarasota Bay boating region. The sample design generated group-specific information for users of (1) marina wet-slips, (2) dry storage facilities, (3) public ramps, and (4) private docks. Questionnaire recipients identified trip departure sites, travel routes and favorite destinations on a map. Spatial information from 1908 returned surveys was digitized into a GIS. Also, descriptive data about boaters including demographic (e.g., seamanship skills, local knowledge, motivations, and perceptions) and trip information (e.g., starting time, duration, activities, and frequency) was collected and linked to the spatial data within the GIS. Descriptive and spatial analyses highlight use according to user-group, vessel type, vessel draft, and activity. This information is being used to help locate boating infrastructure and to support manatee protection plans.

P31. USING AN IMS AND COASTAL REMOTE SENSING FOR K-12 EDUCATION

Peter A. Bower and Dawn J. Wright, Oregon State University
Melissa Feldburg, The SMILE Program, Oregon State University

We have constructed a new Image Mapping Service (IMS) website with the goal of helping middle through high school students learn about ocean processes. This IMS site was developed in conjunction with the Oregon Coastal Atlas, an existing IMS site which allows a diverse audience of coastal users to access information about the Oregon coast. The main objective of this project is to create educational lessons that make use of a IMS site to allow students with basic computer skills to learn about large scale ocean process from actual ocean satellite imagery. The use of an IMS site allows students who have no prior training or access to GIS software to view real ocean data and perform simple analysis without extensive software training or data processing.

The new IMS site features remotely sensed ocean images showing physical parameters and includes data from biological surveys conducted during the US GLOBEC Cruise off the Oregon Coast in the summer of 2000. The satellite imagery was selected from different time periods to show students key seasonal trends and differences in physical conditions between years that occur off the Pacific Coast.

We will demonstrate this new IMS site and show the associated educational modules. The process of building the site, working with student outreach organizations, working with teachers, and key considerations in planning for construction of an IMS site will be topics for discussion.

P32. MARINE GIS DATA DERIVED FROM NOAA ELECTRONIC NAVIGATIONAL CHARTS
Matthew Austin, NOAA Coast Survey Development Laboratory

NOAA's Electronic Navigational Charts (NOAA ENC®s) have been developed to support the marine transportation infrastructure and coastal management. The NOAA ENC®s are in S-57, a data standard developed by the International Hydrographic Organization (IHO) to be used for the exchange of digital hydrographic data. NOAA ENC®s can be used in Geographic Information Systems (GIS), allowing for broader public access. Many GIS's, however cannot read an ENC's native S-57 format to address this problem. NOAA's ENC® Direct to GIS experimental web portal provides comprehensive access to display, query, and download all available large scale NOAA ENC® data in a variety of GIS/CAD formats for non-navigational purposes using Internet mapping service technology. Nautical chart features contained within an NOAA ENC® provide a detailed representation of the U.S. coastal and marine environment. This data includes coastal topography, bathymetry, landmarks, geographic place names and marine boundaries. Features in an NOAA ENC® are limited in that they only represent the geographic region that is depicted in that particular NOAA ENC®. By aggregating nautical features from all NOAA ENC®s in the creation of GIS data, a contiguous depiction of the U.S coastal and marine environment is achieved. In the Internet mapping service, marine and coastal features are represented as layers organized into categorical groups. NOAA ENC® Direct to GIS layers can be explored using the Internet mapping service's GIS tools. Symbolization of NOAA ENC® Direct to GIS data is generalized in the user's browser since the data is not certified for navigation. Geographic place name labels also provide orientation. NOAA ENC® Direct to GIS allows users to specify the output format, coordinate system and the spatial extent of the data they wish to download through query and selection tools.

P33. SOUTHEAST-GEOGRAPHIC FISHERY-INDEPENDENT SURVEY AND HISTORICAL (SEA-GEOFISH) DATABASE SITE'S ROLE IN THE MANAGEMENT OF MARINE RESOURCES
David dosReis, Perot Systems Government Services at the NOAA Coastal Services Center
Jessica Stephen and Phil Weinbach, Marine Resources Research Institute, South Carolina Department of Natural Resources

For over thirty years, a large-scale fishery monitoring and assessment program (MARMAP and related projects), funded by NOAA Fisheries and conducted by the South Carolina Department of Natural Resources (SCDNR), has focused on collecting and analyzing data to determine the status of marine fish stocks. The data have been instrumental in the development and implementation of traditional fishery management plans and newer ecosystem-based management strategies such as Marine Protected Areas. Tools that allow stakeholders to analyze and visualize this information can help foster more informed decision making for the management of marine resources.

One such tool is the SEA-GEOFISH Database site, which is an Internet Map Server (IMS) application. The site not only provides a wide range of users access to important fisheries data, but it also offers users a series of GIS-based analysis tools for a greater understanding of the data. This recent collaborative effort between the NOAA Coastal Services Center and the SCDNR is designed to serve as an educational tool that stakeholders, particularly resources managers, can use to aid in their management decisions. The SEA-GEOFISH Database site is part of a broader vision of the SCDNR to provide stakeholders with the ability to access the necessary information for sustainability of the resources.

Included in the mapping interface are standard "out-of-the box" IMS tool functions (zoom in/out, pan, identify). The site is also composed of several customized tools designed to further enhance its functionality and supply users with additional information for the management of fishery resources.

P34. DMS DATA MANAGER: GIS TOOLS FOR MANAGING NAVIGATION CHANNELS
Alexandra Carvalho, Kenneth R. Craig, and Charles Haynes,, Taylor Engineering, Inc.
Al Fletcher, P.E., U.S. Army Corps of Engineers, Jacksonville District

The Diagnostic Modeling System (DMS) is an integrated decision support system that provides waterway managers and engineers with a series of data handling and analysis tools to manage current and historical information from navigation channels. Jointly developed by the U.S. Army Engineer Research and Development Center and Taylor Engineering, Inc., the DMS seeks to reduce future channel Operations and Maintenance expenditures by addressing the root causes of persistent "hot spot" channel shoaling areas.

At the core of the DMS system is the Data Manager, a GIS based application that runs on the GIS software package ArcGIS ™ (Version 9.0). The Data Manager consists of a structured geodatabase that stores historical and recent project information associated with a maintained channel, and a series of tools and methodologies that help engineers to plan and design navigation channels. The Data Manager can handle and analyze bathymetric data, and identify, and quantify channel shoaling areas. The Data Manager also includes project setup tools to create and load new project data to project geodatabases.

Through the ArcMap™ application and the Data Manager's user-friendly interface, project engineers can quickly organize and display the data stored in an existing geodatabase, analyze and quantify trends, recognize emerging and recurring channel problem areas, and develop a rapid diagnosis of the channel shoaling problems.

Taylor Engineering Inc. has developed the most recent version of the Data Manager, Version 3.0, for the Jacksonville District of the U.S. Army Engineers. This paper presents an overview of the DMS Data Manager, and of its application to the Jacksonville Harbor project.

P35. Withdrawn

P36. FORECASTING HARMFUL ALGAL BLOOMS AND PROVIDING HEALTH INFORMATION TO THE PUBLIC

Mary Culver, NOAA Coastal Services Center
Rebecca Love, I.M. Systems Group at the NOAA Coastal Services Center
Cynthia Heil, Florida Fish and Wildlife Conservation Commission
Barbara Kirkpatrick, Mote Marine Laboratory
Richard P. Stumpf, NOAA National Centers for Coastal Ocean Science

Blooms of the toxic dinoflagellate *Karenia brevis* are responsible for serious public health concerns and shellfish harvesting closures in the Gulf of Mexico every year. To help coastal resource managers decide where to focus their sampling efforts and prepare for these blooms, the National Oceanic and Atmospheric Administration has developed the Harmful Algal Bloom (HAB) Forecast System. The forecast system uses analyzed ocean color imagery, winds, weather predictions, and monitoring data to assist resource managers in their sampling strategies to monitor shellfish harvesting areas by providing them with information on the location of *K. brevis* blooms and forecasts of bloom initiation and movement. The next step for the system is to improve the information to address public health risks, particularly respiratory distress, which is caused by the toxic aerosols produced by this species when cells are lysed by wind and wave action. This information is of interest to a broader community than resource managers, and this requires that HAB forecasts are released with increased attention to the error that may be associated with the information. NOAA, state and county officials, and citizens groups have created criteria for a conditions report that is available to the public on the HAB Forecast System website. The 2004 bloom season is providing a test case for the criteria in order to develop responsible, effective, and useful information for public health concerns.

P37. A TRAJECTORY MODELING TOOL FOR COASTAL MANAGEMENT DECISION SUPPORT

David L. Eslinger and Kirk Waters, NOAA Coastal Services Center
Doug Wilson, NOAA Chesapeake Bay Office
Tom Gross, NOAA Coast Survey Development Laboratory; Chesapeake Research Consortium

The NOAA Coastal Services Center, the NOAA National Ocean Service Coast Survey Development Laboratory, and the NOAA Chesapeake Bay Office have developed a management support tool to provide interactive trajectory paths in estuaries. The purpose is to be able to track and forecast the motion of particles—larvae, contaminant releases, oil spills, etc.—via a versatile, web-based user interface. The clickable web interface accesses an integrated system of ocean observations, hydrodynamic model outputs, a trajectory calculator, extensive databases of environmental descriptors, and active biological models of particle behavior. Graphical results are delivered via the web in a GIS-enabled manner.

The tool was initially designed for a specific task: providing environmental managers with modeled information on oyster larvae transport and recruitment, which they could use to address the introduction of a non-native oyster species into the Chesapeake Bay. However, because of the modular development methods and adherence to common standards, the tool will be easily extensible to other regions and a variety of particle types. Follow-on research is being conducted to enhance both the hydrodynamic and biological modeling aspects of the program.

P38. METHODS FOR CONDUCTING USER NEEDS ASSESSMENTS (UNA) TO SUPPORT DECISION SUPPORT SYSTEM IMPLEMENTATION

David J. Buckley and Dave Bouwman, Geo360 Corporation

The implementation of a geospatial decision support system (DSS) in a structured manner is essential for a successful and cost effective application of geospatial technology. GIS has unlimited potential as both a strategic planning support tool, and a tactical decision support and operational management tool. However, the lack of well defined user needs, minimal implementation planning, and a mismatch between requirements and technology selection are common pitfalls that have limited success in the past.

A clear understanding of organizational, operational, data management, and technical issues is crucial to the successful implementation of GIS related technology. A comprehensive UNA approach must incorporate data (spatial and non-spatial), information products derived from data (maps, reports, charts), information publishing requirements, technology components (COTS software, hardware, network), software application components (analysis techniques, models), and deployment, implementation and training requirements. The complex array of information that must be understood to properly design and implement a DSS dictates that a formal and comprehensive UNA methodology be used.

User needs and requirements definition are the cornerstone of a systems development lifecycle. The key activity during an assessment is the definition and compilation of current status, user needs, and functional requirements through the analysis of internal and external client business processes. The definition of detailed business processes that identify the role of spatial data and related information products is critical. Properly understanding business activities establishes the basis for designing DSSs that meet these processes and, often, enhance the work flows for future implementation.

This presentation will review UNA methods and how they can be applied at different scales to support the successful development and implementation of decision support systems.

P39. ECOREGIONAL ASSESSMENTS AS AN APPROACH TO SUPPORTING REGIONAL OCEAN GOVERNANCE

Dan Dorfman, Zach Ferdaña, and Mike Beck, Global Marine Initiative, The Nature Conservancy

The Nature Conservancy and its partners have conducted ecoregional assessments in nearly all of the coastal regions of the United States. These assessments identify a set of species and systems which have significant needs for natural resource management decisions. We then integrate information on the distribution of these targets and threats to these targets into a spatial decision support framework. This approach enables us to establish a suite of priority areas for conservation management action.

But the ecoregional assessment approach also has powerful applications for enabling Regional Ocean Governance. The Nature Conservancy, in partnership with NOAA's Coastal Services Center and the University of Washington, is researching ways to support regional ocean governance with a pilot project in the Pacific Northwest. By providing agencies and partners with an integrated set of information on resource distributions and threats, we are enabling management agencies to see their activities within an ecosystem context. The collection of information from the full range of information sources (ESI, NWI, etc.) which are active in the coastal environment enables each individual program to see how its actions fit within the context of entire ecosystems. The information resources and decision support system which is initially used to establish a vision for biodiversity representation can also be used by partners to make individual governance decisions within a regional context. Our assessment approach can be adapted to answer a wide range

of specific questions relating to aspects of ecosystem information. By distributing information resources and a decision support framework we not only enable a transparent analysis of our priority focus areas, but we also enable local agencies to address local resource management needs while having a broader context readily accessible.

A regional decision support framework is seen as a first step towards establishing an ecosystem-based regional ocean governance framework.

Land Use and Community Planning

P40. APPLICATION OF ENVIRONMENTAL INDICATORS IN DELINEATING AND ASSESSING SENSITIVE WATERBODIES AND WATERSHEDS

Subijoy Dutta, P.E., S & M Engineering Services
William E. Roper, PhD, P.E., George Mason University

Watersheds and water bodies can be considered as the heart of a community in any rural or urban area. Availability of clean water is unarguably the most valuable and desirable item in our everyday life. Our vulnerability to drinking water cannot be more emphasized when fast growth, mismanagement of lawn care and land development practices are all so common in many parts of the country. Our creeks and rivers oftentimes carry heavy loads of silts, nitrates, phosphates, and pesticides from these activities. Our drinking water sources also get contaminated with these pollutants either through surface water runoff or groundwater recharge.

This paper examines and explores various simple methodologies and tools to assess the health of our watersheds and water bodies by use of environmental indicators, such as remote sensing technologies, gauging spatial and temporal changes in the watersheds, and screening level field measurements of water quality and related environmental quality and impacts on the local ecology.

Two case studies involving rivers, creeks and watersheds of Loudoun County, Virginia and Northern India will be covered in this paper. The case study on Loudoun County involved use of fifteen different environmental indicators by the LEIP (Loudoun County Environmental Indicators Project). These indicators included Roadside imagery; Aerial, Digitized, and Conventional map imagery; Forest areas; Agricultural lands; Wetlands; Riparian areas; Impervious surfaces; Urbanized areas; Listed plant species; Key soil types; Water quality; Air quality; and Historic and cultural sites.

P41. GIS AND FIELD-BASED ANALYSIS OF THE IMPACTS OF RECREATIONAL DOCKS ON THE SALTMARSHES OF GEORGIA

Michael H. Robinson, Georgia Southern University
Clark R. Alexander, Skidaway Institute of Oceanography

Population pressure along the Georgia coast has greatly increased the number of docks that extend across the marsh, impacting marsh ecosystems. To understand the patterns and impacts of dock proliferation, aerial photography and field data were used within a GIS to quantify the number and area of docks affecting marsh. These maps show the footprint of docks from 1970 to 2000 on Wilmington Island, GA, and document a 90% increase in total dock area (24,048 m^2 in 1970 to 45,679 m^2 in 2000) and a 73% increase in number of docks during this period (174 docks in 1970 to 301 docks in 2000). Indicators of shading impacts to the *Spartina alterniflora* marsh (i.e., variation in stem density and plant height) were quantified along 56 transects. Average stem density was 56% lower beneath docks than adjacent to docks and paired data were statistically different. Plant height was not significantly different beneath or adjacent to docks. Although presently unquantified, shading effects may be important for the carbon budget of the marsh, which provides critical habitat for many commercially important species. Dock structures presently shade 0.5% of the marsh and maximum estimates of cumulative impact under current Georgia law suggest that ~5% of the marsh could be shaded. Additional information needs identified during this study include: an assessment of enhanced *Spartina* wrack accumulation around dock structures; a determination of the impact to benthic habitats by floating docks that sit on the bottom at low tide; and a comparative analysis of coastal county dock statistics with the baseline and trend data in this study.

P42. THE WAI`ANAE ECOLOGICAL CHARACTERIZATION: FACILITATING WATERSHED MANAGEMENT AT A COMMUNITY LEVEL

Mark Mazzola, Hawaii Coastal Zone Management Program

The Hawaii Coastal Zone Management Program (HI CZM) has been involved in a multi-year initiative to merge traditional Hawaiian management practices with modern resource policies in Wai`anae, a predominantly native Hawaiian community located on the western shore of O`ahu. This effort, part of HI CZM's Cumulative and Secondary Impacts Initiative, brings together numerous community leaders, government agencies, and stakeholders to develop an integrated watershed management framework for the Wai`anae moku, a traditional district divided into several ahupua`a, historic land divisions based on watersheds and other natural features. The goal of the management framework is to integrate the traditional and cultural values and resource issues of each ahupua`a with the responsible stewardship and sustainable use of Wai`anae's resources in the entire moku.

The Wai`anae Ecological Characterization (WEC) is a tool that was developed as part of the Wai`anae management framework. The WEC is an interactive CD-ROM with information and planning tools for community leaders, educators, researchers, partnering agencies, and other stakeholders and interested parties. It contains information on Wai`anae's aquatic and terrestrial environment, socioeconomic characteristics, and historic and cultural traditions. There is also a significant spatial component to the WEC, with explanations of how GIS data can be used to understand the impacts of new development and land use changes on natural and cultural resources. As the Wai`anae community is developing its management framework, HI CZM will provide outreach and training to assist community leaders, agencies, and the public in using the WEC to facilitate their efforts in land and resource management.

Marine Protected Areas

P43. U.S. MARINE MANAGED AREAS INVENTORY ATLAS: A TOOL FOR VISUALIZING SPATIAL DATA

Joel Murray, National Ocean Service, Special Projects

The Departments of Commerce and the Interior are developing an inventory of marine managed areas (MMA) in the United States that are currently protected and managed under federal, state, territorial, tribal or local laws. The completed MMA inventory will contain information on each site including a general description and site characteristics such as location, purpose, and type of site, along with detailed information on natural and cultural resources, legal authorities, site management, regulations, and restrictions. The goal of the MMA inventory effort is to provide a comprehensive information base to assist in the development of a national system of marine protected areas (MPA).

The MPA website (*www.mpa.gov*) provides tools for users to explore and obtain information on the MMA Inventory. One of these tools is the U.S. Marine Managed Areas Inventory Atlas. The Atlas is an ArcIMS map service, which allows users to spatially identify and query MMAs throughout the United States, create custom maps and download MMA data for further analysis. The Atlas can also be utilized as a presentation tool for natural resource management and academic purposes. Eventually, “MMA significant” base layers will be added to the Atlas so users can readily identify spatially relevant sites. The U.S. Marine Managed Areas Inventory Atlas is a basic tool for visualizing spatial data; however, the robustness of ArcIMS will allow its usefulness to continue to develop.

Ocean Observing Systems

P44. THE NOAA OBSERVING SYSTEM DATABASE AND WEBSITE

Ted Habermann, NOAA National Data Centers
Kelly Stroker, University of Colorado

NOAA owns and operates many research and operational observing systems. During 2003 information about over 80 observing systems from all NOAA Line Offices was collected into a geospatial database with the assistance of the observing system managers. This database forms the basis for the NOAA Observing System Architecture website (*nosa.noaa.gov*). The website presents the data in several different ways. 1) A page for each observing system includes brief descriptions and pictures, supports queries based on station attributes and provides a link to the observing system homepages where users can read more about the observing systems they are interested in. 2) An interactive map allows users to display multiple observing systems as layers and provides access to information about (and data from) specific stations. 3) A “Find Your Place” section enables users to locate observing systems using states, congressional districts, or other regions. 4) A “Web Image Slide Tray” provides quick access to simple maps that make it easy to compare coverage of different observing systems in a given state or region. In addition to the website, the geospatial database supports network access to the observing system data for desktop GIS tools and Open GIS Consortium compliant clients.

Remote Sensing Applications

P45. HOW A STATE AND FEDERAL PARTNERSHIP IN LAND COVER MAPPING CAN WORK: A CASE STUDY IN THE STATE OF MAINE

Andrew Brenner, Space Imaging
Mike Smith, State of Maine
Rick Jones, Space Imaging

Throughout the country, states are embarking on land cover mapping programs to analyze and monitor change occurring within their boundaries. At the same time multiple federal agencies have maturing programs to map land cover and monitor change. While federal agencies such as NOAA, USGS, EPA and others have committed to working together towards meeting their varying program requirements, an opportunity exits for states to partner with these agencies as well to leverage the experience of these larger federal programs into individual statewide mapping specifications and goals.

This presentation describes the approach utilized by the state of Maine to coordinate with NOAA and USGS in an effort to generate an updated land cover map covering the state. The state’s requirement for a 5m resolution map covering additional classes than either C-CAP or NLCD

acquire required the generation of a more in-depth approach to generating the land cover map. Therefore, additional methods were developed to refine the NLCD-based classification scheme to meet the requirements of the Maine land cover classification scheme. These refinements and the methods utilized to meet the requirements of the state are presented.

P46. A TOOL FOR PLANNING AERIAL PHOTOGRAPHY

Patrick J. Clinton, Indus Corporation
David R. Young and David T. Specht, U.S. Environmental Projection Agency, Office of Research and Development, National Health and Environmental Effects Research Lab, Western Ecology Division, Pacific Coastal Ecology Branch

The U.S. EPA’s Pacific Coastal Ecology Branch has developed a tool in the form of an Excel® spreadsheet that facilitates planning aerial photography missions. The spreadsheet accepts various input parameters such as desired photo-scale and boundary coordinates of the study area and compiles an ArcInfo® macro language (AML) script for generating a photo-center coordinate list and geographic information systems (GIS) datasets for constructing flight maps. The spreadsheet also compiles an Internet address or URL for downloading a digital basemap of the study area from seamless digital raster graphic USGS quadrangle maps. One meter resolution black-and-white digital orthophotos corresponding to the area of each planned aerial photo may also be downloaded via URLs generated by the utility. A number of other output parameters such as total number of photos and the size of a photo in megabytes when digitized are useful in interactive flight planning. The tool greatly reduces the amount of time it takes for Principal Investigators and GIS professionals to plan aerial photo missions. To fully utilize this tool, the user must have access to Excel®, ArcInfo® v7x (or later) and the Internet.

P47. ACCURACY ASSESSMENT OF COASTAL LAND COVER PRODUCTS OUTSOURCING PARTERNERSHIPS FOR IMPROVED PRODUCTION

Rick Jones, Space Imaging
Nate Herold, NOAA Coastal Services Center

The National Oceanic and Atmospheric Administration’s (NOAA) Coastal Services Center is currently developing national land cover and change data for the coastal zone of the U.S. as part of its Coastal Change Analysis Program (C-CAP). NOAA has worked closely with private industry partners, such as Space Imaging, to produce products that contribute to the overall vision of C-CAP as a source of current, highly accurate, highly useful information in the coastal zone; and to improve the techniques utilized in their production. By drawing on the experience and expertise industry has to offer, and combining that knowledge with the Center’s understanding of coastal community needs, C-CAP products are being produced in a more timely, consistent, and cost-effective manner than previously possible. As part of this effort, NOAA and its partners have implemented a unique quality assurance process to ensure that these products meet the C-CAP specifications. The process combines an accuracy assessment by the contracting partners followed up by an independent validation by NOAA staff. This presentation discusses the process and methods that are implemented by both the contracting companies and the program staff at the Coastal Services Center.

P48. CHARACTERIZING COASTAL OCEAN ECOSYSTEMS USING REMOTE SENSING TECHNIQUES

Susan Dunham, Environmental Careers Organization
Kristine Holderied and Richard P. Stumpf, NOAA Ocean Service, Center for Coastal Monitoring and Assessment

The characterization of estuarine environments is complicated by extreme changes in coastal conditions. Variability over large areas is difficult to assess using shipboard and moored measurements. The use of satellite data and analysis techniques can help with the identification of seasonal and annual patterns and contribute to the overall understanding of the variability and intensity of these patterns over various time scales. This study uses temporal classification, a remote sensing technique typically used to improve discrimination of crops on land, as an effective means to identify driving processes (upwelling, winds, etc.) in the ocean environment and how these processes vary spatially and temporally in three National Marine Sanctuaries in California. Patterns in sea surface temperature, chlorophyll, and turbidity are identified and analyzed to indicate responses to anthropogenic and natural factors.

P49. ESTUARINE PHYTOPLANKTON PRIMARY PRODUCTION AND SIZE AS DETERMINED REMOTELY FROM AIRCRAFT AND COASTAL OBSERVATION SYSTEMS

Darryl J. Keith, U.S. Environmental Projection Agency, National Health and Environmental Effects Research Lab, Atlantic Ecology Division
James A. Yoder, University of Rhode Island, Graduate School of Oceanography

We used remotely sensed estimates of chlorophyll *a* and sea surface temperature, incorporated into the Chesapeake Bay Productivity Model (Harding et al., 2002), to estimate the spatial and temporal variation of phytoplankton net primary production and species size in the Narragansett Bay (RI) estuary. Phytoplankton size was estimated based on the ratio of production-to-biomass, an approach observed in published studies from mesocosm experiments and field observations. From late May to October 2002, Narragansett Bay was generally characterized by a mean daily production rate of 0.74 (standard deviation = $\pm$ 0.1) g C m^2 day^{-1} along West Passage and 0.47 ($\pm$ 0.1) g C m^2 day^{-1} along East Passage. These estimates were comparable to published C^{14} measurements from mesocosm studies of the bay. East and West Passages were generally dominated by mixed and netplankton (>20 *u*m) size classes during the early summer period. Nanoplankton (<20 *u*m) sizes were dominant along both passages during late summer into fall.

Spectral data obtained from passive remote sensing of estuarine and near coastal waters using low-altitude aircraft can be integrated with water column measurements from NOAA National Ocean Service coastal monitoring stations to predict phytoplankton biomass and productivity, as well as species size. We envision that data acquired from aircraft will be integrated into future coastal observing systems to monitor those estuarine and coastal systems, presently below the resolution of ocean color satellite platforms, at the temporal and spatial scales required to provide a strong scientific basis for environmental decisions.

P50. COMPENSATING FOR IRRADIANCE FLUXES WHEN MEASURING THE SPECTRAL REFLECTANCE OF CORALS *IN SITU*

Merlin Lawson, Department of Geosciences and Center for Advanced Land Management Information Technologies (CALMIT), University of Nebraska–Lincoln
Nick Emanuel, Bryan Leavitt, Donald Rundquist, and Richard Perk, Center for Advanced Land Management Information Technologies (CALMIT), University of Nebraska–Lincoln
Jennifer Keck, Roatan Institute for Marine Sciences, Roatan, Honduras

As scientists seek to better monitor coral community health using images acquired from aircraft and/or satellite platforms, reflectance spectra acquired for coral at close range using field radiometers are routinely examined. The rapidly changing underwater light climate complicates the collection of consistent *in situ* hyperspectral reflectance of coral species. Fluxes of incoming irradiance, measured both above and below the water surface, are drastically influenced by changing atmospheric conditions (cloudiness), changes in the air-water interface (wave glint), and subsurface fluctuations (water column height). The protocol of many researchers studying coral reflectance signatures at depth has not paid adequate attention to these dynamic, rapidly changing conditions. This study employs an ensemble of instruments to characterize the spectral reflectance variability of one coral feature (*Diploria labyrinthiformis*) at a site along the northwest coral reef off Roatan Island, Honduras. Over a two-hour period, flux measurements of incoming irradiance above and below (at depth) the water surface were collected in an effort to quantify relationships between measured fluxes in incoming irradiance and spectral reflectance variability. Spectral measurements were made using two hyperspectral radiometers mounted on a "tripod apparatus."

Given the reality that sky conditions typically are changeable, especially in tropical locations during data collection, it was determined that employment of a dual-fiber optic (upward- and downward-looking) system significantly reduced the variance of the spectral reflectance of a coral target. The authors recommend adoption of the dual-fiber configuration to ensure standardization of hyperspectral signatures submitted to coral hyperspectral libraries.

P51. REMOTE SENSING OF COASTAL REGIONS FROM SPACE PLATFORMS

Edward G. Howard, NOAA Satellites and Information

NOAA has focused more efforts recently on sensors and systems for coastal and ocean applications. We envision improved sensors in the future like our Geostationary Series of GOES R satellites. And there may be hyper-spectral sounders and imagers with the ability to observe and map 10 to 30 meter underwater features.

This new work will be reported in two parts. First, we have processed both multi-spectral and hyperspectral images from the Hyperion sensor on EO-1 satellite. We have done trade analyses between greater spatial resolution (possible multi-spectral) and narrow spectral bands (possible hyper-spectral) sensors. For example a fixed 10 meter spatial resolution in only a few bands, may not do as well on coral reef sensing as a 50 meter sensor with 60 or more narrow spectral bands. These trades and image simulations can give the future scientist and resource manager what he/she needs to make better decisions.

In a second element of our work, we look at the required temporal resolution needed for assessing coral reef health including bleaching events, tidal effects on coastal erosion, and time intervals for matching remote sensing results with coastal computer models. Needs are not the same for different times of the year or for different regions of the world.

P52. AUTOMATIC SMALL VESSEL DETECTION UTILIZING IKONOS

Kevin H. Pegler and David J. Coleman, University of New Brunswick
Ronald Pelot, Dalhousie University
C. Peter Keller, University of Victoria

Rescuing operators of small recreation vessels is a constant resource drain on the limited operating budget of the Canadian Coast Guard. As a result, a new and innovative application of small target surveillance techniques is being developed. This work is being done in support of the development of a strategic decision making tool based on risk modeling to be used to predict where in Canadian waters marine incidents are most likely to occur in support of best resource allocation.

This paper investigates the ability of IKONOS imagery to detect small recreational boats. To accomplish this, automatic target detection software called MRV Recon has been developed which makes use of a weighted Euclidean distance metric.

To test the detection accuracy of MRV Recon, a dataset was created by gathering position and attribute data for 53 recreation vessel targets within Cadboro Bay, British Columbia, Canada. IKONOS imagery was collected in May 2003.

The overall detection accuracy was 77%. The targets were broken down into two categories: A) less than 6m in length, and B) greater than 6m long. The detection rate for the category B targets was 100%, while the detection rate for the category A targets was 61%. It is important to note that some category A targets were selected specifically to test the detection limits of MRV Recon. The smallest target detected was 2.2 metres long and 1.1 metres wide. The analysis also revealed that the ability to detect targets between 2.2 metres and 6 metres long was diminished if the target was a dark colour.

P53. METEOROLOGICAL PARAMETERS IN WATERSHED MODELING DERIVED THROUGH REMOTE SENSING

Louis Wasson and Jeff Ballweber, Mississippi State University

The Upper Pearl Watershed located in central Mississippi covers over 2000 square miles in 15 counties. The environment of the Upper Pearl Watershed is rapidly changing due to residential and commercial development in the Jackson metropolitan area, the state capital, and further upstream near Philadelphia, MS. These changes may present water quality challenges to both the Pearl River and the Gulf of Mexico coastal waters. Heavy precipitation events in Upper Pearl can significantly impact coastal fisheries and essentially close near shore oyster reefs for several days until the transported pollutants from the Pearl River dilute to safe levels. Modeling the relationship between meteorology and climatology and water quality could provide valuable management insights to upstream managers on downstream, coastal impacts.

Developing such a model faces some daunting challenges. Surface weather stations are the typical source for meteorological data but the distribution of these stations results in large spatial gaps in data coverage. It can rain in one part of the watershed but never be recorded and placing a weather station every few kilometers would be unrealistic.

This paper examines the validity of using remotely sensed meteorological observations using NASA's Tropical Rainfall Measurement Mission (TRMM) satellite, NOAA's Multi-Precipitation Estimate (MPE) and GOES satellite Hydro Estimator (HE). Methods for automating the retrieval, storage and manipulation of the these data will be developed to produce daily and weekly mean precipitation data over the Upper Pearl watershed and applying it to the Arc Hydro data model and Corps of Engineers simulation models for watershed best management.

P54. Withdrawn

P55. CLASSIFICATION OF *PHRAGMITES AUSTRALIS* IN TIDAL WETLANDS OF THE CONNECTICUT RIVER ESTUARY USING MULTI-TEMPORAL QUICKBIRD SATELLITE IMAGERY

Sandy Prisloe and Emily H. Wilson, University of Connecticut
Martha S. Gilmore, Wesleyan University
Daniel L. Civco and James D. Hurd, University of Connecticut

Phragmites australis is a highly invasive plant that forms dense monocultures. In the past thirty years it has displaced native vegetation and significantly altered the composition of plant communities in salt and brackish tidal marshes in the lower Connecticut River estuary. Over the past several years, federal, state and local government agencies and nonprofit organizations have conducted extensive *P. australis* eradication work to return these tidal marshes to their prior natural condition; however, there was no program to monitor and measure the long-term efficacy of the eradication. To assist with wetland restoration and monitoring efforts, researchers at the University of Connecticut and Wesleyan University used high-resolution multispectral QuickBird imagery, acquired for a 100 km^2 area at the mouth of the Connecticut River at intervals from late May through September 2004, to develop a protocol to classify, map and monitor for the presence and/or reinvasion of *P. australis*. Field spectra for *P. australis* also were collected at regular intervals with a hand-held reflecting spectrometer. These data, which recorded spectral changes due to plant phenology, were used to help classify *P. australis* in QuickBird imagery acquired at different points throughout the growing season. Classification of *P. australis* was accomplished using multiple dates of imagery with image segmentation and object-oriented classification techniques. Results of this research will be used to identify *P. australis* in non-treated tidal wetland areas and to monitor its reinvasion at previously eradiated sites.

P56. HIGH-RESOLUTION TOPOGRAPHY AT THE COASTAL SERVICES CENTER: ACQUISITION, QUALITY ASSURANCE AND ANALYSIS, AND DISTRIBUTION METHODS

Kirk Waters, NOAA Coastal Services Center
Andrew Meredith and John McCombs, I.M. Systems Group at the NOAA Coastal Services Center
Jamie Carter, Perot Systems Government Services at the NOAA Coastal Services Center

High-resolution topography is sought by the coastal management community for a variety of purposes ranging from floodplain mapping to erosion estimation. The Coastal Services Center has been collecting and distributing high-resolution topography since 1996 with several partners. We will describe our methods of acquisition, quality assurance and analysis, and distribution of the data. Particular focus will be on quantitative lidar quality assurance with GPS surveys and methods used for qualitative assessments of IfSAR data.

P57. VOYAGES OF EXPLORATION – ENVISIONING A PRE-SETTLEMENT LANDSCAPE FOR THE TIDEWATER CHESAPEAKE REGION

John C. Wolf, National Park Service, Chesapeake Bay Program Office

The year 2007 marks the 400th anniversary of Captain John Smith's founding of Jamestown, the first permanent English settlement in America. It also marks the beginning of a series of voyages by Smith around the Chesapeake Bay between 1607 and 1609. The anniversary of Smith's "Voyages of Exploration" presents a significant opportunity for the National Park Service's Chesapeake Bay

Gateways Program to engage visitors in discovering Smith's travels and the Chesapeake of the early 17th century.

A team of historians, archaeologists and environmental scientists is carrying out the "Voyages of Exploration" initiative, coordinated by the Maryland Historical Trust and the Virginia Department of Historic Resources. The "Voyages of Exploration" partners are developing an illustrated book documenting the best current knowledge of: Smith's voyages around the Chesapeake Bay, the 17th century natural environment of the Chesapeake, and Native American settlements and culture of the 17th century Chesapeake.

GIS is being used to help interpret the landscape of the early 1600's. A combination of readily available and custom GIS data is being used to depict Smith's voyages and the environment he encountered, including the impact of Native American society on the tidewater landscape. The pre-settlement landscape decision rules consider ecoregions, geology, slope, aspect, soils, and hydrography (including pre-settlement wetland distribution). Native American settlement locations and the corresponding landscape "disturbances" were provided by project historians and archeologists. The passageway of Smith's voyages is being used as the path for 3-D navigation and visualization applications in the Chesapeake Bay and its tributaries.

P58. GEODATABASE DEVELOPMENT FOR ROAD MANAGEMENT: THE ARMY CORPS OF ENGINEERS TENNESSEE-TOMBIGBEE WATERWAY (MOBILE DISTRICT)
Rita Jackson, Mississippi State University
Roads for both commercial and recreational transportation are a critical component of coastal management. Coastal managers are often challenged to fully recognize, plan and manage road maintenance to minimize traffic disruption and potential adverse impacts to other coastal resources. Waterway managers share this concern. Specifically, the Army Corps of Engineers Tennessee Tombigbee Waterway located in the Mobile District, is responsible for 234 miles of the Tombigbee River, which empties into the Mobile Bay and the Gulf of Mexico. On both sides of the massive river, roads are used for commercial and recreational transportation for water dependent activities. The Corps has approximately 53 miles of paved roads and 130 miles of unpaved roads on the waterway. These roads have various functions. Roads are used as access roads into the waterway's ten locks and dams, as well as public access into roads into campground and day camp use facilities.

Managing the maintenance of these roads can be difficult without an appropriate system to track road conditions and record and update road maintenance projects. Accordingly, the Corps is developing a geodatabase to assist in these activities. A geodatabase stores spatial as well as attribute data. The key component in the geodatabase is its ability to efficiently relate spatial data and attribute data in a management system. The geodatabase will also be used as an inventory and maintenance tool to help the Corps more efficiently plan and prioritize their long term maintenance needs and manage day-to-day roads management. This type of geodatabase would be directly transferable to state governments and management agencies.

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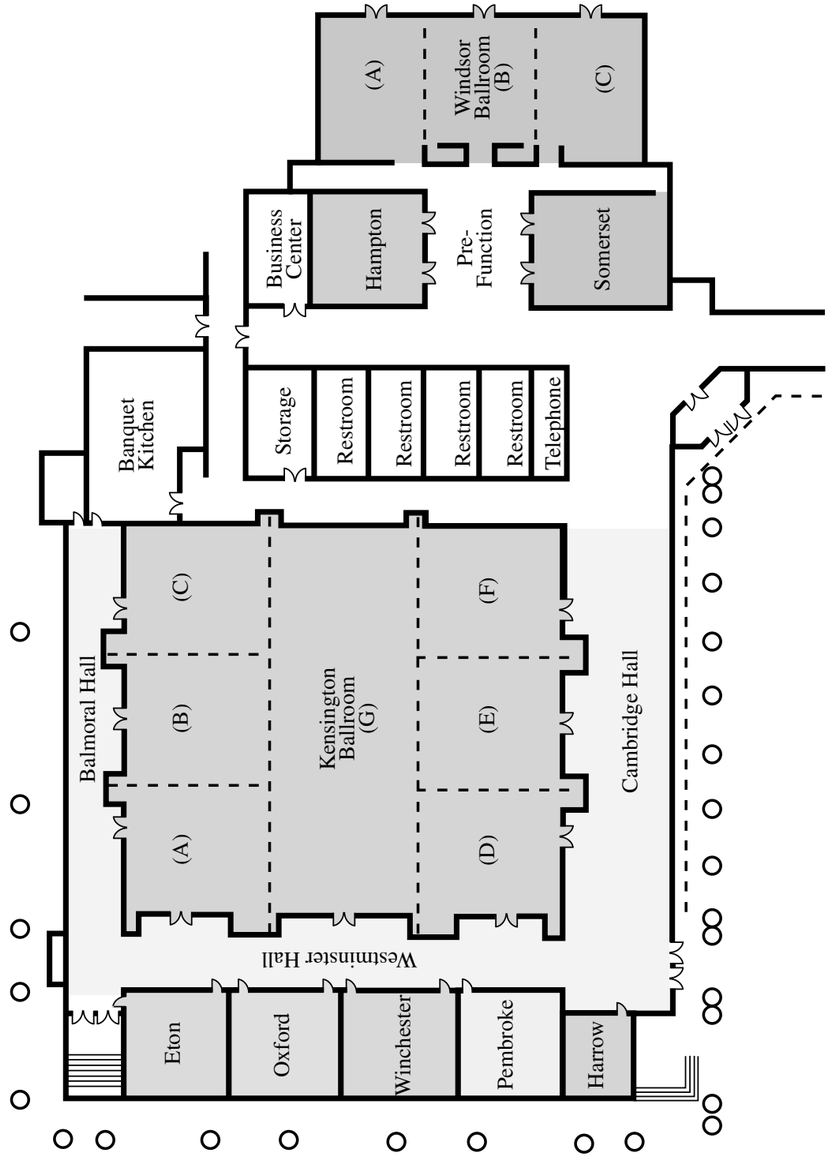
Embassy Suites Conference Center Floor Plan



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