2005

Center for Coastal Resources Management Annual Report 2005

Center for Coastal Resources Management, Virginia Institute of Marine Science

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Center for Coastal Resources Management

Annual Report 2005
Center for Coastal Resources Management

2005 Annual Report

Virginia Institute of Marine Science
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Center Programs
**Background**

The Center for Coastal Resources Management exists to develop and support integrated and adaptive management of coastal zone resources. To fulfill this mission, the Center undertakes research, provides advisory service, and conducts outreach education. These tasks are carried out by a staff of professional scientists and technical experts using a mix of state funding and grant/contract support.

Within its broader mission, the Center has specific tasks to support Virginia’s wetlands and shoreline management programs. These core activities create a natural focus on the littoral zone and riparian lands in coastal and estuarine areas. Management of resources in these areas has evolved from resource-specific considerations to system-level perspectives. The Center has been an active agent in this change, and has developed the required internal capabilities and external collaborations to support multidisciplinary approaches to management and policy issues.

The Center currently manages its multiple activities within three broad and interacting programs.

**The Wetlands Program**

The Wetlands Program deals with both tidal and nontidal wetlands. The program conducts basic research on the structure and functions of these systems, collaborating with researchers throughout the mid-Atlantic region. A wide variety of applied research is also undertaken. This includes policy option analysis, functional assessment methods, inventory and monitoring techniques, and creation/restoration protocols. The Wetlands Program provides extensive support to the Commonwealth’s two management programs through review of individual tidal wetland permit applications, training for local and state managers, and development/management of data bases supporting and tracking regulatory program activities.
Permits Reviewed 1972 - 2005

2005 Virginia Permit Sites
Coastal Inventory Program

The Coastal Inventory Program has a basic mission to monitor tidal shoreline conditions and to develop policy/management recommendations based on analysis of that information. The Coastal Inventory Program has developed extensive capabilities in geographic information systems and in analysis of remotely sensed information. It has expanded its inventorying activities to include almost all terrestrial and aquatic resources within the coastal zone in support of the Center’s focus on integrated and adaptive management. Development of GIS-based analytical protocols has become a major activity in the Coastal Inventory. Development of these tools has proven to be a most effective mechanism for integrating technical understanding and extensive data sets in a format that is comprehensible and informative for managers. The Coastal Inventory generates detailed shoreline condition inventories for every tidal county and city as part of its basic mission, and shares its extensive GIS data bases with state and federal agencies throughout the region.
Coastal Watersheds Program

The Coastal Watersheds Program evolved to deal with the water quality/quantity, land use, and habitat issues that were part of integrated management of coastal resources. The program focuses on basic and applied research in support of policy and regulation development. There are both regional and international elements in the Coastal Watershed Program. The program is working on development of indicators for health of aquatic ecosystems, use conflict management plans for shallow waters, anadromous fish spawning and nursery habitat studies, and climate change impact assessments. Because much of the work on use conflict analysis, shallow water management, and fishery habitat assessment is of interest in coastal systems around the world, the Center manages growing international collaborations through the Coastal Watersheds Program.
Personnel and Funding

The Center has a full time staff of about 28 individuals and supports several graduate students. The staffing varies slightly depending on grant and contract activities. Currently the Commonwealth of Virginia provides base funding for the Center that covers less than 50% of the salary expenses and about 15% of the annual operating expenses. The balance of funding is derived from grant and contract activity. The primary sources of this support have been the U.S. Environmental Protection Agency and Virginia’s Coastal Resource Management Program (funding from NOAA). Other sources of recent funding have included National Oceanic and Atmospheric Administration, National Science Foundation, Virginia Department of Health, Virginia Department of Conservation and Recreation, and private donors.

Center for Coastal Resources Management

Comprehensive Coastal Inventory
- M.R. Berman
- H.E. Berquist
- J.D. Herman
- S. Kibben
- J.M. Huang

Coastal Watershed Program
- T.C. Rudinsky
- D.E. Schatt
- D.W. Welles
- M.K. Nunez
- M.J. Strickler

Wetlands Program
- D.M. Bilkovic
- N.M. Hill
- K.K. Reay
- D.M. Seanhope
- M.J. Strickler
Center Fellows

The Center Fellowship Program is designed to enhance capabilities to provide the very best research and advice by ensuring a constant influx of new ideas and perspectives. The goal is to bring dynamic young scientists into close collaboration with Center staff on a continuing basis. Each year one or two researchers from other institutions will be appointed to a two-year term as Center Fellows. Each Fellow is expected to spend a minimum of one week in residence at the Center giving seminars and leading workshops in areas of their particular expertise. In addition, Fellows are engaged in development of proposals for collaborative research that may extend well beyond their formal appointments. Fellows are selected by the Center’s leadership based on nominations from Center staff or colleagues at other institutions. The selection process emphasizes the goal of bringing in post-doctoral scientists who have begun careers as independent researchers, with expertise that compliments but does not duplicate Center staff expertise. Fellowship Program success is measured by the number of new research topics and approaches developed from these collaborations. These appointments started on May 1, 2004.

Dr. Anamarija Frankic is an assistant professor in the Environmental Earth and Ocean Science Department of the University of Massachusetts in Boston. She is interested in coastal ecosystem management, and particularly in adaptive management applications to establish sustainable practices in coastal environments. Anamarija received a B.S. in Biology and an M.S. in Ecology and Limnology from the University of Natural and Mathematical Sciences in Zagreb, Croatia, her homeland. Her Ph.D. was earned at the Virginia Institute of Marine Science, College of William and Mary. Anamarija is currently teaching and conducting research on management of aquaculture, protected areas, and tourism/ecotourism. She has worked as a contractor and consultant for the World Bank and Global Environment Facility on a variety of ecosystem conservation projects in Croatia, and has been an active participant in multiple workgroups sponsored by the United Nations. She has worked with CCRM staff in establishing collaborations with coastal centers in Croatia and Ireland, and has directed and/or participated in research projects focused on integrated coastal management involving CCRM staff and students.

Dr. Chris Pyke is a scientist with the U.S. Environmental Protection Agency’s Global Change Research Program in Washington, D.C. Dr. Pyke studies interactions between climate and land use change. He is particularly interested in opportunities for local and regional scale adaptation through land protection, low impact development, and Smart Growth. Dr. Pyke is an at-large member of the Chesapeake Bay Scientific and Technical Advisory
Dr. Denice Wardrop is a research faculty member in the Cooperative Wetlands Research Center at Pennsylvania State University. Dr. Wardrop has been engaged in investigation of nontidal wetlands structure and function in the ridge and valley province of Pennsylvania. She has also been an active participant in a number of technical advisory committees at the state, regional, and federal level, including the national committee on Biological Assessment of Wetlands. Dr. Wardrop’s expertise is particularly important to the VIMS’ Center staff as they undertake development of new wetlands assessment protocols for the Commonwealth of Virginia. She is currently collaborating with the VIMS’ researchers in a multi-institutional project to develop indicators of aquatic ecosystem health. This work is now evolving to pursue related lines of research through new proposals.

Center Adjunct Research Faculty

CCRM Adjunct Research Faculty are College of William and Mary colleagues from other departments or schools. These individuals collaborate with Center staff on a continuing basis in basic and applied research. Adjunct Research Faculty expand the expertise available for CCRM projects, constituting a very efficient mechanism for addressing multidisciplinary issues. Appointments are for fixed terms and are renewable as the work of the Center and the interest of faculty members dictate. Success in the Adjunct Research Faculty program is judged by generation of collaborative proposals and research products. The first appointments to the CCRM Adjunct Research Faculty were made in December 2005.

Dr. Randy Chambers is Associate Professor of Biology and Director of the Keck Environmental Field Laboratory at The College of William and Mary. He received a B.A. in Biology from Gettysburg College, an M.S. in Zoology from the University of Massachusetts-Amherst, and a Ph.D. in Environmental Science from the University of Virginia. His research interests are in environmental science and the ecology and restoration of
wetlands. Currently, he teaches courses in watershed ecology, environmental science and policy, and wetland ecosystems. Dr. Chambers’ most recent projects include an evaluation of invasive plants in tidal wetlands, long-term research in the Florida Coastal Everglades, and the study of turtles in southeastern Virginia wetlands.

Dr. Gregory Hancock is Associate Professor of Geology at the College of William and Mary. A geomorphologist and hydrologist, Greg is interested in the impacts of land use change on Coastal Plain streams, and the effectiveness of engineered structures (i.e. retention ponds) on minimizing these impacts. He is collaborating with James City County to evaluate the effectiveness of retention ponds for controlling stormwater runoff, and is investigating the impacts of urbanization-induced channel incision on local riparian groundwater systems.

Center Associate Researchers

CCRM Associate Researchers are scientists from other institutions, government agencies, and/or the private sector who collaborate with Center staff on research and advisory projects. Appointment as an Associate Researcher is based on sustained productive interaction. Appointments are for fixed terms and renewable as appropriate. The first appointments of CCRM Associate Researchers were in September 2005.

Daniel Redgate is an Environmental Scientist at Kimley-Horn and Associates, Inc. His research interests include Hydrology, Assessment and Restoration of Streams and Wetlands; Watershed Modeling, Assessment and Water Quality Improvement. Dan is presently working as a consultant in the assessment and design of stream and wetland ecosystems, and in the evaluation of watershed-scale water quality improvement measures. He received a B.S. in Ecology from The Pennsylvania State University, and an M.S. degree from the Virginia Institute of Marine Science, The College of William and Mary. While studying at VIMS, Dan’s research focused on the hydrology of forested wetlands and seasonal water budgets of forested wetland mineral flats. Dan has since worked on the assessment and design of numerous wetland and stream restoration sites for the purpose of compensatory mitigation and for watershed water quality improvement. His research interests are wetland and stream hydraulics and hydrobiology, riparian ecology and restoration science. He is working on the development of regional hydraulic geometry relationships for stream design, an evaluation of techniques for the assessment of stream quality, and the assessment of perennial, intermittent and ephemeral streams. Dan is a member of the Society of Wetland Scientists and the Virginia Association of Wetland Professionals.
Dr. Ed Sharp was born in Uniontown, PA, attended Wheeling College and John Carroll University and received a Ph. D. from Texas A&M University in 1966. He conducted basic research in the area of applied nonlinear optics at the U.S. Army Night Vision & Electro-Optics Laboratory and the U.S. Army Research Laboratory until this past year. Presently he is working as a consultant on the use of infrared imaging equipment in novel application areas. His major areas of interest include laser crystal physics, thermal imaging materials and devices, electro-optic and nonlinear-optical processes in organic materials, beam-control devices, optical solitons, harmonic generation, holographic storage, and photorefractive effects in ferroelectric materials. He is the author or co-author of more than 100 technical publications and holds over 15 patents on optical materials and devices. He is a member of the American Optical Society, IEEE, The American Ceramic Society, and SPIE. Ed currently is working on developing methodologies for the use of thermal imaging in natural resource research.

Center Graduate Students

Mary Huang - Mary is a Ph.D. candidate at the Virginia Institute of Marine Science investigating the role of tidal wetlands as a source of fecal coliform by analyzing the model predicted errors between observed data and water quality model predictions. The results of this work may have an impact on the development of shellfish total maximum daily loads (TMDLs) in Virginia.

Matt Strickler - Matt is also a joint M.A./M.S. candidate for the Thomas Jefferson Program in Public Policy at the College of William and Mary and Department of Coastal and Ocean Policy, Virginia Institute of Marine Science. He is exploring the interactions among shellfish aquaculture, coastal land use, and shallow water environments. His research interests include marine resource policy and economics, coastal zone management, and recreational fisheries.
Center Interns

Each year the Summer Intern Program places twelve to fifteen undergraduates with faculty mentors for a summer research experience. Internships are available in many areas of marine science, including biological, geological, chemical, physical, environmental science, fisheries and management emphases. CCRM hosted five summer interns:

Heather Austin worked on the nontidal wetland assessment in identification of wetland stressors (manmade encroachments such as roads or ditches) within 30 and 100 meters. Heather supported work in approximately 70 total wetland sites.

Zack Kator assisted with the TMDL project by entering data and creating maps for the Division of Shellfish Sanitation shoreline sanitary survey. In previous years, Zach has assisted in the shoreline inventory mapping project.

Ben McFarlane has interned with the Comprehensive Coastal Inventory Program since his sophomore year at University of Virginia. During his internship Ben worked on the Shoreline Inventory Project developing GIS coverages, maps, and doing routine quality assurance measures. Ben will receive his BS in Economics this year from UVA. He hopes to attend graduate school and study urban and environment planning.

Niall Phelan is a graduate student at the University of College (UCC) Cork in Cork, Ireland studying coastal resources management and GIS. He was the first intern from UCC to come to the Center under a proposed student exchange program. Here, Niall worked with our existing shallow water use conflict model with an interest in applying the model to comparable issues, particularly those pertaining to aquaculture, in the Irish Sea.

Monica Wait is a graduate student at the College of William and Mary in the Thomas Jefferson Program for Public Policy. Monica worked on an analysis of the costs of a suite of management options to improve water quality for the purposes of growing shellfish. The analysis also included estimates of benefits from shellfish production if the water quality was sufficiently improved to meet Virginia’s shellfish waters standard.
Center Collaborations

East Carolina University
Pennsylvania State University
College of William and Mary
Maryland Department of the Environment
Smithsonian Environmental Research Center
Environmental Law Institute
Virginia Polytechnic Institute and State University
Dept of the Army, Night Vision & Electro-optics Div.(retired)
U.S. Environmental Protection Agency
University of Cork
Riparian Shoreline Assessment and Mapping for the Chowan River, NC

PI: Berman  
Funding Agency: Albemarle Pamlico National Estuary Project (APNEP)  
Period: 5/16/05-5/15/06  
Amount: $30,000

This project produces an inventory of shoreline conditions for the Chowan River Basin. Following a survey and analytical protocol applied in Virginia and Maryland (see also Comprehensive Shoreline Inventory for the state of Maryland, and Shoreline Situation Reports) this inventory expands the geographic extent of a Mid-Atlantic mapping initiative southward. Like products from the Virginia and Maryland regions, final survey results, data, and maps will be posted on the internet when project is completed at: http://ccrm.vims.edu/gisdatabases.html

GIS Conversion of VMRC Fisheries Management Areas

PI: Berman  
Funding Agency: NOAA/CRMP  
Period: 6/01/05-12/31/05  
Amount: $30,000

This project generates a GIS database of the location of Virginia’s managed fisheries areas within the Bay. Fisheries Management Areas (FMAs) within Virginia include artificial reefs, sanctuaries, oyster reefs, and important finfish spawning grounds, to name a few. They are the cornerstone of the Federal government’s Marine Managed Areas Inventory for Virginia. FMAs are surveyed, managed, and regulated by the Virginia Marine Resources Commission. In a cooperative project between VIMS and VMRC, these data have been converted to GIS formats for integration into other state and federal aquatic management initiatives. Among them is Blue Infrastructure, which collects and disseminates aquatic resource data in an interactive GIS format accessible through the Internet. Virginia’s FMA boundaries and database have been added to Blue Infrastructure as a project deliverable. Link to project page at: http://ccrm.vims.edu/blueinfrastructure/bi_intro.html
Development of the “Blue” Portion of Virginia’s Blue/Green Infrastructure Mapping

PIs: Berman, Herschner
Funding Agency: Virginia Coastal Program
Period: see above
Amount: see above

New data developed in 2005 delineating the location of Virginia’s managed fisheries areas within the Bay have been added to this existing project. These include artificial reefs, sanctuaries, oyster reefs, and important finfish spawning grounds, among others. See project above for project and funding information. Link to project page at: http://ccrm.vims.edu/blueinfrastructure/bi_intro.html

Comprehensive Shoreline Inventory for the State of Maryland

PI: Berman
Funding Agency: NOAA/MD DNR
Period: 8/01/02 – 9/28/06
Amount: $340,000

This project involves application of the shoreline inventory protocols developed by the Center to all of the tidal shoreline in Maryland. The resultant data base provides a spatially explicit inventory of shoreline condition, resources, and structures in a GIS accessible format. The project involves extensive field work to complete boat surveys of the shoreline with advanced GPS equipment. Link to GIS databases at: http://ccrm.vims.edu/disclaimer_shoreline_situation.html

Field Inventory of Phragmites

PIs: Berman, Havens
Funding Agency: various, inhouse
Period: ongoing

The delineation of Phragmites along tidal shorelines is being collected in conjunction with data for the Shoreline Situation Reports. Analysis of status and trends in distribution will be used in management and policy recommendations.
The Stability of Living Shorelines - An Evaluation

PI: Berman
Funding Agency: NOAA
Period: 10/1/2004 - 12/03/2006
Amount: $160,000

This project seeks to define scientific rational for the expanded use of soft structure stabilization for tidal shoreline protection. A series of tests will be performed to develop a profile of landscape suitability for soft shoreline stabilization. Analyses will be performed on data describing shoreline condition. Shoreline change mapping will occur in selected study areas to determine effectiveness of shoreline treatments. An environmental assessment will combine various data to develop the shoreline profile for effective soft stabilization. Final products include a report and outreach material to be posted to a dedicated website.

Shoreline Situation Reports for Selected Localities: Caroline and Stafford Counties

PI: Berman
Funding Agency(s): NOAA
Period: ongoing
Amount: $30,000

This project advances the development of Shoreline Situation Reports throughout the cities and localities within the Tidewater region of Virginia. Shoreline Situation Reports were first developed by VIMS in the 1970s to support coastal management activities and decisionmaking. CCI is attempting to update the series, and publish a new inventory for each city or locality. The process includes robust data collection in the field using GPS equipment, post processing of data using GIS and remote sensing tools, and the development of map inventories on a county by county basis. With funding from the Virginia Coastal Resources Management Program, two additional inventories will be added to the Virginia Shoreline Inventory shortly. The counties of Caroline and Stafford will come online sometime in early 2006. GIS data for all published inventories are posted under Shoreline Situation Reports at: http://www.vims.edu/ccrm/gis/gisdata.html
Internet Based Decision Tool for Siting Wetland Restoration Sites in Hampton Roads, Virginia

PI: Berman  
Funding Agency: In-house  
Period: ongoing  
Amount: (F)$61,771 + (M)$20,590 = $82,361  

Revised in 2005, the update now includes Virginia’s entire coastal zone. This project uses the protocol and findings of the Advanced Identification of Wetland Restoration sites, to develop an interactive, web-based management tool to assist regulators, developers, and project agents in location of potential compensatory mitigation sites in Hampton Roads. The model is now being run for the entire coastal zone in Virginia. Link to ArcIMS at [http://rmapnt52.wetlan.vims.edu/wetlands/viewer.htm](http://rmapnt52.wetlan.vims.edu/wetlands/viewer.htm)

Ecosystem Approaches to Aquatic Health Assessment: Linking subtidal habitat quality, shoreline conditions and estuarine fish communities

PIs: Bilkovic, Hershner  
Funding Agency: NOAA/NCBO  
Period: 3/01/05 – 2/28/06  
Amount: (F) $100,000 + (M) $13,344

This project tests the use of side-scan sonar technology with specially designed classification software, SideView, as a tool to define subtidal nearshore habitat in two representative watersheds of the Chesapeake Bay. Resulting habitat information will be used to determine if specific subtidal habitats are associated with shoreline condition and/or nearshore fish communities. To accomplish this, we will collect and map detailed information on nearshore subtidal habitat, survey nearshore fish communities, and compare available quantitative shoreline inventory information. Habitat mapping protocols, and observed relationships among fish community indices, metrics of subtidal habitat patterns, and shoreline condition will have the potential to be extrapolated to additional watersheds in the coastal plain, and become tools for future development of habitat indices and ecosystem management. For more information see [http://ccrm.vims.edu/powerpoints/Bilkovic_dmERF_files/v3_document.htm](http://ccrm.vims.edu/powerpoints/Bilkovic_dmERF_files/v3_document.htm)
Sturgeon Spawning Habitat on the James and Appomattox Rivers

PIs: Bilkovic, Hershner  
Funding Agency: FWS  
Period: 11/01/05 – present  
Amount: (F) $9,945

This project’s objectives are to conduct bottom mapping of potential Atlantic sturgeon spawning reaches using side-scan sonar to ascertain the presence and location of essential spawning habitat (e.g. gravel beds) in the James and Appomattox rivers.

A Survey of the Effectiveness of Existing Marsh Toe Protection Structures in Virginia

PIs: Duhring  
Funding Agency: Keith Campbell Foundation for the Environment and In-house  
Period: 06/24/04 – 12/31/05  
Amount: (F) $27,370

This is a project funded by the Keith Campbell Foundation/Virginia Institute of Marine Science with the goal of evaluating erosion control effectiveness of existing shoreline treatments that incorporate a living shoreline component in their design. These are mostly marsh toe protection structures and low profile riprap shallow water sills. Both of these approaches, in theory, preserve wetland habitat while attenuating shoreline erosion. The project involves development of evaluation criteria for use in field survey, identification of existing “living shoreline” applications from the VIMS Shoreline Application Data Base and field evaluation of erosion buffering effectiveness of these structures using the previously-developed evaluation criteria. The final step of the proposal was the presentation of the results at a workshop coordinated by the National Estuarine Research Reserve Program in Virginia. Read more about the Living Shorelines Stewardship Initiative (LSSI) at:  
Maintenance of Virginia Nontidal Wetlands Database

PIs: Fleming, Weiss
Funding Agency: In-House
Period: ongoing
Amount: N/A

Maintenance of a website-accessible database for nontidal wetlands permitting in Virginia. For more information, please see http://ccrm.vims.edu/wetlands/nontidal_impacts.html

Historic Oyster Reef Mapping

PI: Hargis
Funding Agency: VMRC, Sea Grant, In-house
Period: 1/1/99 to 1/31/05
Amount: $5,000 (VMRC), $10,000 (Sea Grant)

Historic bathymetric charts dating back to the 1800s and including major tributaries in Virginia are being digitized using ArcInfo. Bathymetric soundings from the mid to late 1800s suggest that bathymetric highs within the rivers may represent historic oyster reefs. Using the triangular integrated network (TIN) model to develop three dimensional representations of these relief areas, the structures appears to be elongated, elliptical or dome shaped. Bottom sampling from the early 1970s reveal that many of these are associated with shell bottom providing some verification that they were oyster reefs. Today, these reefs are gone from Virginia’s tributaries. This ongoing project to reconstruct the distribution of reefs in history may assist in understanding the demise of these habitats and ensure the success of future restoration efforts. See final report at: http://ccrm.vims.edu/pubs/ReefRestRpt.pdf

Occurrence of the Invasive Weedy Species Phragmites australis Adjacent to Agricultural Lands and its Response to Conservation Reserve Program (CRP) Control Methods.

PIs: Havens, Chambers
Funding Agency: USDA
Period: 8/1/03 – 7/31/06
Amount: (F) $179,280

This project focuses on developing a model of Phragmites invasiveness at upland/wetland interfaces by determining the mechanism of invasion, competition and spread of Phragmites.
With respect to weed control, one of our applied hypotheses is that CRP sites enhance N removal prior to groundwater discharge to the wetland-upland interface, and that best management practices like buffer strips are environmentally sound forms of controlling Phragmites invasion and spread.

Intermediate Development of a Forested Headwater Wetland HGM Model for Wetlands Management in Virginia

PI: Havens
Funding Agency: US EPA
Period: 10/01/04 - 09/30/06
Amount: (F) $178,774

The Forested Headwater Wetland Subclass is unique in that it is partially defined in law by the average current flow (or lack thereof) in the associated stream. This project continues the development of an HGM model for the Forested Headwater Wetland subclass by determining the extent of these wetlands systems as related to annual average stream flow. The final report will include development of a preliminary definition of Forested Headwater Wetlands for HGM model development and preliminary data collection of potential HGM variables.

Determination of Minimal Instream Flow for Recreational Use

PIs: Havens, Hershner, Berquist
Funding Agency: inhouse
Period: ongoing
Amount: n/a

Recreational canoeists established a network of gages in the 1970’s that reflect stream levels on Virginia’s rivers. This network of gages depicts at what level canoeing would become impracticable. As such, this is a potential measure of minimal instream flow requirements for recreational boating. This project uses the established network of gages and GPS technology to tie them to elevation benchmarks in order to relate the depicted stream levels to USGS stream gage data.
Ecological and Socioeconomic Indicators for Integrated Assessment of Aquatic Ecosystems of the Atlantic Slope

PIs: Hershner, Havens, Bilkovic, Varnell, Berman
Funding Agency: US EPA
Period: 4/01/01 – 2/18/06
Amount: (F) $1,163,435

Project objectives are to 1) develop and test ecological and socioeconomic indicators of aquatic resource condition, construct models that use environmental, geographic, and stressor data to predict indicator responses, and use models to link upstream watersheds and downstream estuaries. 2) Develop large scale measures for characterizing landscape attributes and land-use patterns to serve as predictors of a range of environmental conditions. 3) Deliver a nested suite of indicators to managers, where the implications of aggregating models at various scales are considered, and for which reliability is known. This is a collaborative project with Pennsylvania State University, Smithsonian Environmental Research Center, East Carolina University, and the Environmental Law Institute. Final report: http://ccrm.vims.edu/projreps/eagles_02-03.pdf

Shallow Water Use Management Plan

PI: Hershner
Funding Agency: n/a
Period: 7/1/00 - present
Amount: n/a

This project used GIS to evaluate conditions suitable for a variety of activities that may occur within the shallow water zone of the estuary. Uses include SAV growth, aquaculture, crabbing, recreational fishing, etc. Nearly 20 uses were modeled. First use suitability models were developed, specifying conditions which must exist for a particular use to occur. Second, GIS algorithms are prepared to analyze available environmental data and indicate areas of suitable conditions for each use within the shallow water zone. Spatial models of use suitability were then combined according to a conflict prediction model to identify potential use conflicts. Final steps in the project will be identification of management issues and options, and development of policy recommendations.
Monitoring the Active Replenishment of Subsiding Habitat (MARSH) Project

PIs: Hershner, Havens, Bilkovic, O’Brien
Funding Agency: Private donors
Period: 12/1/00 to present
Amount: $158,002

This project is an ongoing study of the Lee, Hill, and Sweet Hall marshes in the Pamunkey River. The study focuses on the documentation of the relationship between marsh surface elevation and the marsh plant community. The project includes experimental manipulation of the study sites involving a variety of methods for raising the elevation of the marsh. Evaluation of the potential for controlling the composition of the marsh plant community by incremental additions of material to the marsh surface is underway. Other studies include the community structure of birds, fish, insects, and benthos as well as detailed water quality and elevation monitoring. An interim report can be found at http://ccrm.vims.edu/MarshNewsletter.pdf

Development of Nontidal Wetland Inventory, Functional Assessment, and Monitoring Strategy for Virginia

PIs: Hershner, Havens, O’Brien
Funding Agency: USEPA/Virginia DEQ
Period: 10/1/03 – 9/30/06
Amount: (F) $606,405

This project develops and implements a three level assessment protocol for nontidal wetlands in Virginia. This is the first phase of a series of projects which are intended to provide assessments across all of Virginia. In this project a level I – GIS based assessment will be completed on all wetlands mapped by the National Wetlands Inventory in Virginia. Level II assessments involving field assessments of stressors will be initiated in the coastal plain of Virginia. Level III assessments will involve detailed analysis of habitat and water quality functions on selected sites. Preliminary site selection in the coastal plain will be undertaken in this project phase.
CARA/MUAR

PI: Hershner, Reay
Funding Agency: PSU/NOAA/EPA
Period: 10/1/02 – 9/30/05
Amount: $60,000

This project involves collaboration with researchers from Penn State University, Rhode Island University, and Carnegie Mellon University. The Center’s role is facilitation of a case study of climate change and landuse change information use in Hampton Roads, VA. The project is intended to result in development of a climate change center that can provide web-based information of maximum utility to local planners and decision makers. The CARA Hampton Roads website can be found at http://ccrm.vims.edu/cara_web/index1.htm

Development of TMDL Models for Virginia Shellfish Growing Waters

PIs: Hershner, Mason, Herman, Kator, Shen
Funding Agency: Department of Environmental Quality
Period: 4/1/03 – 4/30/05
Amount: $294,496

The development of shellfish TMDLs for the condemned areas on the 1998 303d list of impaired water bodies in Virginia is a joint effort between the Virginia Institute of Marine Science, the Division of Shellfish Sanitation, and the Department of Environmental Quality. This project involves development of the databases and report formats for these models.

Project Update: There were two methodologies being used to determine source load allocations: watershed modelling and bacterial source tracking (BST). VIMS considers the watershed modeling to produce much more scientifically defensible results compared to the BST methods that DEQ is employing. After much discussion with DEQ, VIMS withdrew from the contract to develop bacterial TMDLs for shellfish growing waters.
Wetlands Permit Review and Report Generator

PIs: Hershner, Berman, O’Brien
Funding Agency: inhouse
Period: ongoing
Amount: n/a

This project enhances the permit reporting process to increase the amount of information presented while automating systematic reporting. This is the first system of its kind that combines expert staff review with landscape information retrieved from spatial databases. The report generator is always being modified as new landscape information is available.

Garden Club of America Scholarship

PI: Hershner, Reay
Funding Agency: Garden Club of America
Period: annual (2000 to present)
Amount: $500

The Center manages the annual advertisement, review, and selection of recipients for the Garden Club of America Scholarship for Wetland Studies. Each year the Center advertises and responds to inquiries regarding the award. In February it receives, reviews, and ranks applicants and makes a recommendation to the GCA for that years awards. Awards are open to any graduate student undertaking a field oriented study of wetlands at an American university. For more information, please see http://ccrm.vims.edu/garden_club.html

An Introduction to the Role of Riparian Buffers in Improving Environmental Quality Functions and Values

PIs: Hershner, Duhring
Funding Agency: Chesapeake Bay Restoration Fund
Period: 6/1/2004 - 7/1/2005
Amount: $5,799

Curriculum for a multi-day intensive course was prepared for a specific target audience of natural resource managers and professional staff. This grant supported the development of an interdisciplinary
Interagency Shoreline Management Consensus Document

**PIs:** Hershner, Mason  
**Funding Agency:** Virginia Coastal Program  
**Period:** 8/1/04 – 3/1/05  
**Amount:** $35,000

Just prior to the actual initiation of this project the scope was narrowed from an interagency consensus effort to an intra-agency consensus effort. The project was intended to serve as a first step in future efforts to develop consensus guidance from a broad-based multi-agency integrated management perspective. The final project report was submitted in May 2005. The project report describes the consensus of the Wetlands Program on preferences in shoreline management approaches from an ecological perspective and includes some examples. Some scientific rationale is provided for the consensus thinking as well as a discussion of additional data and management tools to support shoreline decision-making. Final report:  
http://ccrm.vims.edu/projreps/shoreline_consensus_project_final.pdf

Marine Debris Project

**PIs:** Hershner, Havens, Bilokovic, Jasinski  
**Funding Agency:** NOAA/NMFS  
**Period:** 9/21/05 – 9/30/06  
**Amount:** $65,000

This project was intended to demonstrate the feasibility of using side scan sonar surveys to locate abandoned or “ghost” fishing gear, particularly crab pots, in the Virginia tidal waters of the Chesapeake Bay, analyze existing records of ghost pots from the trawl survey program in Virginia, investigate the potential effect of ghost pots on fish communities in Virginia waters; and initially survey of the lower York River for ghost fishing gear. Products include a digital map of the surveyed area, annotated to indicate location of all identifiable fishing gear detected by the side scan sonar as well as a brief preliminary assessment of survey methodology.
Tidal Wetlands Management Technical Support

PI: Hershner
Funding Agency: Virginia Coastal Program/NOAA
Period: annually 10/1-9/30
Amount: (F)$40,000 + (M)$40,000 = $80,000

This project has been a continuing grant renewed annually to support the advisory service provided by the Wetlands Program to the Tidal Wetlands Management program. In particular this grant helps fund the travel costs for site visits and meeting attendance by staff scientists, the publication costs for the Wetlands Newsletter, and some of the expenses of maintaining the tidal wetlands permit data base on line on the Center’s web site at http://ccrm.vims.edu/wetlandpermitintro.html

Funding was provided to support production the following publications:


Preliminary Restoration Support Activities and Technical Advisory

PIs: Hershner, Bilkovic
Funding Agency: CH2MHill
Period: 11/1/05-5/31/06
Amount: $68,000

This draft report is designed to provide background information for evaluation of restoration options in mitigation situations for power generating stations in Virginia. The report provides information on fish species that might be targeted for restoration activities.

There are at least four general ways in which environmental compensation might occur associated with generating station cooling water intakes. These include:

1. direct replacement of lost organisms through culture and stocking programs;
2. enhancement of support-species populations to increase survival in stocks of impacted species;
3. direct enhancement of aquatic habitat to increase suitability for impacted species; and
4. enhancement of watershed conditions to generally improve local and downstream aquatic habitats.
Seasonal Monitoring, Fecal Coliform Loads, Lynnhaven River System

PIs: Hershner  
Funding Agency: Virginia Beach  
Period: 11/1/05-12/31/06  
Amount: $53,259

A collecting and sampling program was developed for fecal coliform following runoff events in the Lynnhaven River System. This information will be used to support water quality and TMDL modeling.

Marine Science Teaching Marsh

PI: Hershner  
Funding Agency: Dreyfus Foundation  
Period: Private Funds  
Amount: $30,000

Funding was provided for improvements to the VIMS Teaching Marsh via improved signage and informational kiosks, updated video cameras, and modifications to the educational website. The website will describe wetland plant species found within the VIMS Teaching Marsh as well as general marsh properties and function. Website information will also include learning activities for children.

Development of Tidal Wetland Inventory and Assessment for York River, Virginia Watershed

PI: O’Brien  
Funding Agency: EPA  
Period: 10/01/04-09/30/05  
Amount: (F)$124,815 + (M)41,606

The objective of this project is to provide VMRC and DEQ the ability to report status and trends of estuarine wetlands along with cumulative impacts to this resource within the York River watershed. CCRM will utilize unique data sets obtained over the past 30 +/- years to provide a GIS-based analysis. In addition to the remotely sensed data outlined above, data previously collected by CCRM’s Comprehensive Coastal Inventory (CCI) will be incorporated into this assessment.
Development of an Inventory and Multi-Level Assessment Method for Virginia, Maryland and Delaware Tidal Wetlands

PIs: O’Brien, Havens, Berman, Hershner
Funding Agency: EPA
Period: 10/01/05-09/30/06
Amount: (F)$155,923 + (M)51,974

This project is designed to provide the Virginia Marine Resources Commission, Virginia Department of Environmental Quality, Delaware Department of Natural Resources and Environmental Control, Maryland Department of Natural Resources and the Maryland Department of the Environment with the ability to report the current extent and condition of estuarine wetlands within three major river systems of the Delmarva. CCRM will develop a Level I, Level II and Level III tidal wetland inventory and assessment methodology for the Delmarva using the estuarine segments of the York River, Virginia, Nanticoke River, Maryland and the Indian River, Delaware as our subject watersheds. Level I involves the GIS-based analysis of remotely sensed data while the Level II protocol will be derived from data collection techniques established by the VIMS Comprehensive Coastal Inventory Program (CCI) for mapping shoreline condition. Level III will produce a reference domain for mid-Atlantic estuarine wetlands using a combination of published literature, existing data and field data collection. Reference sites selected for this tier will be representative of the disturbance and ecological variability within the target watersheds. It is hoped that the development and implementation of a multi-level approach to tidal wetland inventory and assessment along with the utilization of these data by the aforementioned state environmental programs will serve as a prototype for expanded investigations across these states in the future.

Development of DO TMDL for Onancock Creek

PIs: Shen, Herman
Funding Agency: Department of Environmental Quality
Period: 11/1/03 – 7/1/05
Amount: $62,812

Low dissolved oxygen (DO) is often observed in eutrophic waters that receive excessive nutrients and organic matter. DO levels below state water quality standards require the development of a total maximum daily load (TMDL) to determine the reductions needed to meet the water quality standard. The North Branch of Onancock Creek, located on the Eastern Shore of the Chesapeake Bay, is impaired for DO. This project involves the development of a 3-D
hydrodynamic and water quality model to determine various scenarios for source allocations between point and nonpoint sources.

Chesapeake Bay Dune Systems Evolution and Status

PIs: Varnell, Hardaway
Funding Agency: VA Coastal Program
Period: 10/01/00 - 09/30/05
Amount: $530,000

This project combines GIS, GPS, remote sensing, ground surveys, and applied knowledge of sandy shorelines to map and classify the primary and secondary dune and beach systems in Virginia’s portion of the Chesapeake Bay. Analyses of vegetation, grain size, and offshore bathymetry complement beach and dune geomorphology assessments. Products include comprehensive inventories by locality, shoreline change models, management guidelines, and a geologic-based classification system for estuarine dune fields. The final phase of this project entails the analysis of non-jurisdictional beaches. Text and digital reports are available. For more information, see VIMS Shoreline Studies http://www.vims.edu/physical/research/shoreline/
Advisory Activities
### Center for Coastal Resources Management
#### 2005 Advisory Activity

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Advisory Committees

CCRM Staff provided service on the following advisory committees:

Albemarle Pamlico National Estuary Program STAC
Albemarle Pamlico STAC Executive Committee

Corps Craney Island Expansion NEPA Technical Committee
Corps Craney Island Expansion Mitigation Subcommittee
Corps Dredge Management Committee
Corps Elizabeth River Environmental Restoration Steering Committee
Corps Lynnhaven River Environmental Restoration Steering Committee
City of Newport News, Stoney Creek Greenway Corridor Committee

CBNERRS Coastal Training Program Advisory Committee

CBP Budget Steering Committee
CBP Implementation Committee
CBP Information Management Subcommittee
CBP Living Resources Subcommittee, Nontidal Habitat Workgroup
CBP Monitoring and Modeling Workgroup
CBP Nutrient Subcommittee, Forestry Workgroup
CBP Scientific and Technical Advisory Committee
CBP Sediment Workgroup

DEQ Academic Advisory Committee
DEQ Non-Tidal Wetlands Program Technical Advisory Committee
DEQ TMDL Oversight Committee
DEQ Virginia Coastal Policy Team
Elizabeth River Steering Committee

Maryland Chesapeake Bay Recovery Program Advisory Committee
Mid-Atlantic Wetlands Workgroup
National Fish and Wildlife Foundation Targeted Watershed Grants Steering Committee

USDA NRCS State Technical Committee

Virginia Association of Wetland Professionals
Virginia Department of Forestry Virginia Riparian Buffer Workgroup
Virginia Land Conservancy Foundation

VDOT Interagency Coordination Committee
VDOT Woodrow Wilson Bridge Agency Review Committee

VGIN Natural Resources Workgroup

VMRC Aquaculture
VMRC Habitat Management Advisory Committee

Wetlands Board Meeting
William & Mary Parking Committee

York River Watershed Council
Outreach Education Classes in 2005

Presentations and demonstrations were provided to educate local & state agency personnel, wetlands board members and staff, marine contractors and permitting agents, as well as the public on tidal wetland issues.

March 09, 2005

Tidal Wetlands Seminar (132 attended)

- Field Guide to Virginia Salt and Brackish Marsh Plants
  http://ccrm.vims.edu//pubs/brochureannotated2rh.pdf
- Jurisdictions & Permit Process
- Criteria for Evaluation Alterations of Wetlands
- 2004 Cumulative Impacts Assessment
- Living Shorelines Stewardship Initiative (David Burke, Burke Environmental Assoc.)
- Legislative Update & Discussion of Management Issues (Tony Watkinson, VMRC)
  http://ccrm.vims.edu//seminarpresentations/tidalwetlandswkshp1.html

June 16, 2005

Tidal Wetlands Workshop (73 attended)

Morning Field Sessions
- Tidal Wetland Plant Identification
- Walking Tour of VIMS Shoreline Structures
- The Ecology and Management of Beaches & Dunes

Afternoon Presentations
- Shoreline Evolution - a series of historic shoreline images from 1937-2002 (Scott Hardaway, VIMS)
- Case Studies in Living Shorelines
  http://ccrm.vims.edu//powerpoints/VACaseStudies_files/v3_document.htm

October 2005

A Healthy Bay for Healthy Kids: Cooking with Virginia’s First Lady

Fifteen 1st and 2nd graders from local schools got a chance to combine science and cooking during the Healthy Bay for Healthy Kids event at VIMS on October 4th. The students joined Chef John Maxwell and VIMS scientist Dr. Kirk Havens to make a healthy and delicious Chesapeake Bay seafood dish while learning about the natural resources needed to sustain marine populations. The event was part of Virginia’s Seafood Month. http://www.vims.edu/events/healthy.htm
2005 After Hours Lectures

There were 11 “After Hours” public lectures, with funding provided by CBNERRS, the VIMS Communications Department and CCRM with an audience total of 768. Lecture topics included sea level rise, leeches, coastal bird migration, reptiles and amphibians, dissolved oxygen, wetlands, marine mammals, oysters, conservation landscaping, marine geology, and striped bass diseases. http://www.vims.edu/afterhours/2005.html

- A new disease in striped bass: should anglers beware? (January 27, 2005)
- The Ancient Life of Chesapeake Bay (February 24th, 2005)
- Conservation Landscaping: Bay-friendly practices for the Coastal Plain (March 31, 2005)
- Ecology of the non-native oyster *Crassostrea ariakensis* (April 28, 2005)
- Whales and Dolphins and Seals—Oh My! (May 26, 2005)
- Wetlands—the Disappearing Resource (June 30, 2005)
- Dead Zones in Chesapeake Bay: Causes & Consequences (July 28, 2005)
- Reptiles and Amphibians of Lower Chesapeake Bay: Their Natural History and Conservation (August 25, 2005)
- Coastal Virginia: Hub for Bird Migration (September 29, 2005)
- Marine Leeches: Vampires of the Sea (October 27, 2005)
- The Tide Next Time (November 17, 2005)
In 2005, an online discussion forum was established exclusively for wetlands board members to talk about issues and solve problems. Feedback has been very positive regarding development of this forum and discussions have remained lively yet professional.

In 2005, the CCRM web site received 40,246 visits with a total of 11,354 unique visitors. A typical visitor examined 15.17 distinct files before leaving the site. A typical visit lasted for 9.37 minutes. Visitors came from 16,182 distinct Internet addresses. The web server delivered 51,146 unique documents one or more times with delivery of 55 distinct types of documents.

A comparison of 2004 and 2005 CCRM website statistics shows an overall increased use of the system. In 2005, there was an increase of 217 unique visitors, 4,591 more visits, and 5.17 more distinct files were examined with a typical visit lasting 1.37 minutes longer than in 2004 (see Charts 1 & 2).

**Top 15 Website Entry Pages for 2005**
**Sorted by Entry Count**

1. CCRM homepage – ccrm.vims.edu
2. /education.html
3. /scan.php
4. /gis/gisdata.html
5. /output/virginia/intro_oscar.html
6. /gallery.html
7. /wetlands/scan.html
8. /gisdatabases.html
9. /wetlands.html
10. /staff/hershner_ch.html
11. /garden_club.html
12. /output/virginia/viewer.htm
13. /output/elizrvr/viewer.htm
14. /stormwater
15. /chesbaywatch.htm
CCRM Web Usage Comparison
2004 vs. 2005

Chart 1

CCRM Web Usage Comparison
2004 vs. 2005

Chart 2
CCRM Quality Assurance/Quality Control Policy

The Center for Coastal Resources Management conducts applied research and serves as a scientific advisor to federal, state and local agencies, and the general public. The Center recognizes the importance of how work processes are implemented to ensure that data collected are of the needed and expected quality for their desired use. In order to provide accurate information to user groups, the CCRM is dedicated to an aggressive, proactive Quality Assurance and Quality Control program. A myriad of activities occur within the Center, including direct support of laboratory and field investigations, support and training of graduate students and interns, training of resource agency personnel and the public, direct support of state agencies and local governments, and sponsorship of lectures, seminars, conferences and visiting scientists. Research activities include both field and laboratory measurements and the development and validation of ecological models. The general goal of the CCRM Quality System is to ensure accurate, reproducible, and unbiased data.

Operational Procedures

The Center recognizes the need for specific plans for individual data collection operations to ensure that data or information collected are of the needed and expected quality for their desired use. As a Center, the quality assurance operation procedures differ from that of an individual research contract. Each principal investigator is responsible for submitting a project-specific quality assurance plan to the relevant Program Quality Assurance Manager and the Center Quality Assurance Manager. The principal investigators will use the underlying principles described in this document as a framework for the specific quality assurance and quality control plans for each project. These plans should detail:

- The specific objectives of the project, including the hypothesis to be tested.
- The data quality objective for the variables to be measured.
- The specific sampling and analytical protocols required to meet the data quality objective.
- The individual responsible for quality assurance for the project.

All noncompliance or deviation from the approved quality assurance plan will be reported to the Program Quality Assurance Manager and the Center Quality Assurance Manager. A copy of the draft plan can be obtained from the CCRM if a purpose for the report is included in the request. More information about CCRM QA/QC can be found at http://ccrm.vims.edu/qaqc.html