Center for Coastal Resources Management

Annual Report 2004
Center for
Coastal Resources Management

2004 Annual Report

Virginia Institute of Marine Science
P.O. Box 1346
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Report Contents

Center Programs ........................................................................................................... 1
Background .................................................................................................................... 2
Personnel and Funding ................................................................................................ 4
Center Organizational Chart ....................................................................................... 4
Center Fellows ............................................................................................................. 5
Center Graduate Students and Interns ................................................................. 6
Center Projects ........................................................................................................ 7
Current and Planned Focus Areas For CCRM Research ........................................ 18
Advisory Activity for 2004 .................................................................................... 20
2004 Center Website Statistics ............................................................................. 21
Talks Given by CCRM Staff in 2004 ................................................................ 22
Outreach Education ............................................................................................... 24
Meetings Attended by CCRM Staff in 2004 .................................................. 25
CCRM Quality Assurance/Quality Control Policy ........................................ 28
2004 Program Products ......................................................................................... 29
Equipment List ....................................................................................................... 37
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** 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.

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.

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 Watersheds 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.

The Center for Coastal Resources Management

Comprehensive Coastal Inventory

- M. R. Berman
  - Program Director
- H. E. Berquist
  - Sr Programr/Analyst
- J. D. Herman
  - Research Assoc.
- S. Killeen
  - Programmer
- Vacant
  - Lab. Spec.

Coastal Watershed Program

- K. J. Havens
  - Assistant Director, CCRM
- D. M. Bilkoivc
  - Research Associate
- A. Frankic
  - Research Associate
- N. M. Hill
  - Environ. Spec. I
- K. K. Reay
  - Info. Tech. Spec. II
- M. K. Nunez
  - Program
- D. M. Stanhope
  - Lab / Research Manager

Wetlands Program

- T. A. Bernad, Jr.
  - Assistant Professor
- J. Bradshaw
  - Marine Scientist Sr.
- K. A. Duhring
  - Marine Scientist Supervisor
- P. A. Mason
  - Marine Science Supervisor
- D. L. O’Brien
  - Marine Scientist Supervisor
- Todd Herbert
  - Marine Scientist Sr.
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. The first two appointments in the Fellowship Program have been made. These appointments started on May 1, 2004.

**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.

**Dr. Chris Pyke** is a senior fellow at the Conservation International Center for Applied Biodiversity Science. Dr. Pyke graduated from the University of California, Santa Barbara with a degree in geography. He has a background in environmental science and research interests in climate change, land-use, and natural resources management. He is particularly interested in problems that span multiple spatial scales, involving linkages between physical, ecological and social-economic systems. Dr. Pyke has expertise in a number of quantitative methods for analyzing complex ecological systems. He is collaborating with CCRM staff on a multi-institutional project to provide technical information to land-use managers about climate change related impacts. He is also working with CCRM staff on development of a collaborative proposal to investigate relationships between environmental and social conditions across multiple scales in the coastal zone.
Center Graduate Students

**Lindy Dingerson** - Lindy is pursuing two master’s degrees through a concurrent degree program from the Virginia Institute of Marine Science and the Thomas Jefferson Program in Public Policy at the College of William and Mary. Her research focuses on land use and shoreline condition in the context of climate change and sea-level rise.

**Mary Huang** - Mary is a master’s candidate at the Virginia Institute of Marine Science investigating the role of tidal wetlands as a source of fecal coliform by analyzing the residuals 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 three 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.

**Inia Soto** analyzed the relationship between fish community indices, submerged aquatic vegetation, river discharge and coastal development using a combination of GIS and statistics. Anthropogenic impacts on SAV biomass, fish communities and water quality in the lower Rappahannock River, a major tributary of the Chesapeake Bay, were investigated.

![Land Use in the Lower Rappahannock River](image)
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.

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/gisdatabases.html

Monitoring of Thin-Layer Placement of Material Dredged from Bogues Bay Channel in Virginia

PIs: Barnard, Priest, O’Brien
Funding Agency: US Army Corps of Engineers
Period: 8/7/03 – 9/30/04
Amount: $33,631

This project involves assessment of the impacts of spray dredging with disposal onto intertidal salt marshes in the Chincoteague Bay area. Plant communities and dredged material placement will be monitored over several years to develop management guidance for potential wider use of this disposal method. This project is the first phase of the study and incorporates the preliminary survey work and the initial post dredging followup.

Wetland Restoration Plan at Norfolk Naval Shipyard, Portsmouth, Virginia

PI: Priest
Funding Agency: Shaw Environmental
Period: 7/1/03 – 6/30/04
Amount: $11,142

This project involves providing expert advice on the design and construction of a wetlands restoration project on the naval shipyard property.
Development of the "Blue" Portion of Virginia’s Blue/Green Infrastructure Mapping

PIs: Berman, Hershner  
Funding Agency: Virginia Coastal Program  
Period: 10/1/03 – 9/30/04  
Amount: (F) $39,000

This is the first phase of a multipart project to develop a blue infrastructure inventory and analysis for Virginia coastal waters. In this phase data needs are identified with the help of a multi-agency steering committee, and available GIS data sets are assembled. Link to project page at: http://ccrm.vims.edu/blueinfrastructure/bi_intro.html

Training Workshop for Virginia’s Natural Resource Managers: An Introduction to the Toolbox

PI: Berman  
Funding Agency: US EPA  
Period: 8/18/03 – 9/30/04  
Amount: (F) $74,997 (M) $24,999 = $99,996

This project involves design and offering of training for natural resource managers in the use of online tools developed by the Center with previous support from the EPA and other sources. The training is hands-on case studies to demonstrate application of the tools to real world problems relevant to Virginia’s coastal resource managers. Link to .pdf at http://ccrm.vims.edu/ci_coastalManagersWorkshop.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.
Field Inventory of Phragmites

Pls: Berman, Havens
Funding Agency: Various, In-house
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.

Ecological and Socioeconomic Indicators for Integrated Assessment of Aquatic Ecosystems of the Atlantic Slope

Pls: Hershner, Havens, Bilkovic, Varnell, Berman
Funding Agency: US EPA
Period: 4/01/01 – 12/18/05
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.

Development of a Draft Woody Depressional Wetland HGM Model for the Coastal Plain of Virginia

PI: Havens
Funding Agency: US EPA
Period: 07/01/02 - 06/30/04
Amount: (F)$202,203 + (M)$67,401 = $269,604

This project takes the preliminary information developed in completion of the Development of a Forested Depressional Wetland HGM Model project and expands it to a Draft Woody Depressional Wetland HGM Model. The project expands the preliminary reference set from 8 sites to approximately 24 sites and coordinates the model development with similar efforts in Maryland and Delaware.

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

PI: Havens
Funding Agency: US EPA
Period: 07/01/02 - 06/30/04
Amount: (F)$163,199 + (M)$54,347 = $217,546

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 initiates 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.

Internet Based Decision Tool for Siting Wetland Restoration Sites in Hampton Roads, Virginia

PI: Berman  
Funding Agency: In-house  
Period: 01/01/04 – 12/31/04  
Amount: (F)$61,771 + (M)$20,590 = $82,361

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 ArclMS at http://rmapnt52.wetlan.vims.edu/wetlands/viewer.htm

Enhancement of Virginia’s Nontidal Wetlands Regulatory Program III

PI: Hershner  
Funding Agency: Virginia Coastal Program/NOAA  
Period: 10/1/03 – 9/30/04  
Amount: $50,000

This project concludes the work on developing protocols for the nontidal wetlands program, by revising the protocols based on preliminary tests, and working with the Department of Environmental Quality staff to move the protocols into regular implementation.

Tidal Wetlands Management Technical Support

Pls: Hershner, Barnard  
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 online on the Center’s web site.
**Shallow Water Use Management Plan**

**Pl:** Hershner  
**Funding Agency:** n/a  
**Period:** 7/1/00 - 9/30/04  
**Amount:** n/a  

This project uses 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**

**Pls:** 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. Interim Report: [http://ccrm.vims.edu/Newsletter.pdf](http://ccrm.vims.edu/Newsletter.pdf)

**CARA/MUAR**

**Pl:** Hershner  
**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. CARA Hampton Roads website: [http://ccrm.vims.edu/cara_web/index1.htm](http://ccrm.vims.edu/cara_web/index1.htm)
**Historic Oyster Reef Mapping**

**Pl: Hargis**

**Funding Agency:** VMRC, Sea Grant, In-house  
**Period:** 1/1/99 to present  
**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.  

**Chesapeake Bay Dune Systems Evolution and Status**

**Pls: 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.

**Development of TMDL models for Virginia Shellfish Growing Waters**

**Pls: 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, and development of reports for half of the total number of areas.
The process of developing a shellfish water TMDL may be generalized in the following manner:

- Water quality monitoring data are used to determine if the bacterial standard for shellfish have been violated;
- Potential sources within the contributing watershed are identified;
- The necessary reductions in pollutant load to achieve the water quality standard are determined;
- The TMDL study is presented to the public to garner comment;
- An implementation plan is developed and implemented;
- Water quality monitoring data are used to determine if the bacterial standard is being met for shellfish waters.

Watersheds with shellfish TMDLs currently under development include:

- Rappahannock River: Mud and Parrotts Creeks
- Whiting and Meachim Creeks
- Lagrange and Robinson Creeks
- Broad and Jackson Creeks
- Urbanna Creek
- Piankatank River, Lower

See the following DEQ website for other TMDL reports: http://www.deq.state.va.us/tmdl/

**Project Update:** There were two methodologies being used to determine source load allocations: watershed modeling 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.

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**Shoreline Situation Reports**

**PI:** Berman  
**Funding Agency(s):** EPA, CBLAD, In-house  
**Period:** ongoing  
**Amount:** various

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 decision-making. 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. GIS data for all published inventories are posted under Shoreline Situation Reports at: http://www.vims.edu/ccrm/gis/gisdata.html

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**Development of Virginia Nontidal Wetlands Database**

**PIs:** Hershner, Varnell, Weiss  
**Funding Agency:** US EPA  
**Period:** 09/04/01 - 1/31/04  
**Amount:** (F)$124,132

Wetlands Permit Review and Report Generator

Pls: Hershner, Berman, Barnard
Funding Agency: In-house
Period: ongoing
Amount: n/a

This project revitalizes the permit reporting process in an effort to enhance 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.

Remote Sensing of River Bed Structure, Rappahannock River - Assessment of Habitat

Pls: Hershner, Havens, Bilkovic
Funding Agency: In-house
Period: 9/1/02 – present
Amount: n/a

Very high resolution imagery captured during extremely low tands in water levels are being processed to determine river bed characteristics. Image recognition software is being tested as a method for classifying riverbed morphology and composition. The data are being sought as a preliminary fisheries habitat assessment of the river prior to the removal of a large dam known to impact anadromous fish passage. The data will enhance fisheries habitat projects along this and other similar river systems.

Determination of Minimal Instream Flow for Recreational Use

Pls: Havens, Hershner, Berquist
Funding Agency: In-house
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.
Garden Club of America Scholarship

Pl: Hershner  
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 year awards. Awards are open to any graduate student undertaking a field oriented study of wetlands at an American university.

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

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

VIMS will host a one-day program for coastal resource managers to gain a clear understanding of the vital contribution and importance of riparian forest buffers in maintaining the environmental health of the Bay and its tributaries. Various options concerning the minimization of impacts due to population growth will be provided, including design and construction standards for the enhancement of existing buffers.

The Stability of Living Shorelines - An Evaluation

Pl: Berman  
Funding Agency: NOAA  
Period: 10/1/2004 - 9/30/2005  
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.
Development of DO TMDL for Onancock Creek

Pls: 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.

Interagency Shoreline Management Consensus Document

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

This project will seek to develop consensus guidance to identify the range of possible shoreline conditions found along tidal shorelines. For various combinations of riparian and littoral conditions, assessments will be made for the potential habitat and water quality impacts of shoreline development practices. Those that minimize adverse impacts and/or maximize beneficial outcomes will be identified. Shoreline inventory information will be reviewed to determine various combinations of riparian and littoral conditions, as well as the range of shoreline development practices found in Virginia.

Living Shorelines: Evaluation Criteria and Monitoring Approaches to Erosion Control

Pls: Barnard, Duhring  
Funding Agency: Keith Campbell Foundation 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 will be the presentation of the results at a workshop coordinated by the National Estuarine Research Reserve Program in Virginia. Read more in (VWR (Vol.19,No.2) on the Living Shorelines Stewardship Initiative (LSSI).
Current and Planned Focus Areas For CCRM Research

Wetlands Program:

✦ support tidal wetlands management (local Wetlands Boards and Virginia Marine Resource Commission);
✦ support nontidal wetlands management (Virginia Department of Environmental Quality);
✦ develop and maintain tidal and nontidal wetlands assessment and monitoring for Virginia;
✦ develop integration of policy/management guidance for shoreline resources in Virginia;
✦ extend wetland monitoring protocols to other states in region.

Coastal Inventory Program:

✦ develop and maintain tidal shoreline inventory for Virginia;
✦ complete tidal shoreline inventory for Maryland;
✦ develop and promulgate geodata toolkit for local governments;
✦ develop “blue infrastructure” inventory and planning for Virginia;
✦ export monitoring and analysis protocols to cooperating national and international programs (e.g. Coastal & Marine Resources Centre, University College Cork, Ireland)

Coastal Watershed Program:

✦ develop and extend shallow water use management plan for Virginia;
✦ develop indicators of aquatic ecosystem condition;
✦ develop guidance for water resource management in coastal plain;
✦ develop and implement shallow water habitat inventory program;
✦ develop innovative solutions for coastal resource sampling problems (e.g. acoustic signatures, thermal imaging, side scan sonar mapping).
Advisory Activities
### Center for Coastal Resources Management
#### 2004 Advisory Activity

<table>
<thead>
<tr>
<th>Month</th>
<th>Information Requests</th>
<th>Additional Site Visits/Field Consults</th>
<th>Meetings</th>
<th>Advisory Reports/Publications</th>
<th>Permit Website Hits</th>
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<td><strong>337</strong></td>
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The website for the Center for Coastal Resources Management was redesigned in 2004. The site was re-evaluated, updated and given an overall cohesive look with improved navigational buttons and a site map to make the pages more “user-friendly.” New features added to the site included a “CCRM News” section on the homepage alerting users to the most current information; a “Wetlands Information” section listing education or workshop opportunities; and a “Manager’s Toolbox” with quick links to mapping and GIS tools. A research site featuring sea-level changes in Hampton Roads was developed for the Consortium for Atlantic Regional Assessment (CARA) and linked to the CCRM site. New information and research project links were added to the Garden Club of America Scholarship, GIS database, management tools, and projects pages.

Future development items consist of a wetland plant and coastal structure photo gallery, revision of the tidal wetlands page, as well as additional coastal managers tools and links. On-line wetlands training may also be an option for CCRM website users in the future.

Executive Summary

A program to summarize CCRM website statistics provided the following report: 11,137 unique visitors came to the site. The web site received 35,655 visits. A typical visitor examined 10 distinct files before leaving the site. A typical visit lasted for 8 minutes. The top 5 trails followed consisted of the Elizabeth River and OSCAR pages, wetlands searches, and the CCI gallery of maps.
Talks given by CCRM staff in 2004

January
Anamarija Frankic  
Environment Sets the Limits for Sustainable Coastal Management
David O'Brien  
Hurricane Isabel: Storm Tide, Storm Surge and Implications of Sea-Level Rise

February
Anamarija Frankic  
Analytical Approach for Integrating Natural and Social Sciences in Sustainable Coastal Management
David O'Brien  
Field Indicators of Hydric Soils in the United States

March
Carl Hershner  
Hierarchical Approach to Wetlands Assessment in Virginia
Helen Woods  
Improving Oyster Reef Siting Criteria: Use the Past to Restore the Future
Kirk Havens  
Phragmites australis (Common Reed Grass): A Threat to Biodiversity or a Natural Component of the Ecosystem?
Marcia Berman  
Database Development for Oyster Restoration Management
Marcia Berman  
Use of GIS and Remote Sensing to Model Wetland Restoration Site Suitability

May
Carl Hershner  
From the Drain to the Ocean - Water Movement in the Chesapeake Bay Watershed
David O'Brien  
VIMS Wetland Advisory Program; Permit Review and Advisory Service
Donna Bilkovic  
Six Fish and 600,000 Thirsty Folks - A Fishing Moratorium on American Shad Thwarts a Controversial Municipal Reservoir Project in Virginia, USA
Karen Duhring  
Tidal Wetland Functions & Values
Kirk Havens  
All Drains Lead to the Bay
Tom Barnard  
Teaching Marsh and Forested Buffer Walks
Walter Priest  
Southgate Plaza Wetland Restoration Project
Walter Priest  
Swash Bay Dredged Material Management Plan

June
Anamarija Frankic  
Local Communities and ICM
Anamarija Frankic  
Sustainable Coastal Management
Karen Duhring  
Case Studies Illustrating Jurisdictional Issues Related to Shoreline Management
Kirk Havens  A Protocol for Assessing the Condition of Wetlands
Kirk Havens  Level 1 and Level 2 Assessment of Virginia’s Nontidal Wetlands
Marcia Berman  An Introduction to CCI Online Tools

July
Anamarija Frankic  Analytical Approach for Integrating Natural and Social Sciences in Coastal Management
David O’Brien  Freshwater Wetland Plant ID
Julie Herman  Science, GIS and Resource Management
Karen Duhring  Coastal Habitat Tours
Karen Duhring  Teaching Marsh Tour
Tom Barnard  Marsh Plant ID

August
Marcia Berman  Blue Infrastructure

September
Carl Hershner  Developing and Communicating a Taxonomy of Indicators
Carl Hershner  Modeling Use Conflict in Shallow Water to Inform Management
Karen Duhring  Adaptations of Salt Marsh Plants & Animals
Karen Duhring  Public Relations at the VIMS Teaching Marsh
Karen Duhring  Adaptations of Salt Marsh Plants & Animals
Pam Mason  A Science Based Approach To Aquaculture Management Strategies

October
Carl Hershner  Development of Shellfish Growing Area TMDLs in Virginia
Carl Hershner  Marshes of the Pamunkey River
Karen Duhring  Purpose & History of VIMS Teaching Marsh
Kirk Havens  Nontidal Wetland Assessment in Virginia
Kirk Havens  Wetlands Regulation in Virginia
Pam Mason  Shallow Water Use Management - A Strategy To Resolve Conflicts

November
Carl Hershner  Coastal Watersheds
Carl Hershner  Hurricane Isabel Impacts and Lessons
David O’Brien  Landscaping with Native Plants to Reduce Maintenance and Improve Water Quality
Julie Herman & Marcia Berman  Applications of GIS to Coastal Problems - Lessons Learned in Virginia
Julie Herman & Marcia Berman  Implementing GIS to Solve Coastal Problems in Virginia - Lessons Learned

continued
**November (concluded)**

Julie Herman  
Marcia Berman  

*Sediment Budgets at Watershed Scales*  
*Introduction to Blue Infrastructure*

**December**

Carl Hershner  

*Effective and Ineffective Science Communication in the Chesapeake Bay Program*

**Outreach Education Classes in 2004**

**July**

Tidal Wetland Seminar – Presentations and demonstrations were provided to educate local government and state agency personnel, as well as the public, on tidal wetland issues.
Meetings Attended by CCRM Staff in 2004

January
Aquaculture Management
Blue Infrastructure Project
Buckroe Beach Borrow and Nourishment
Builders for the Bay
CBP Forestry Workgroup
CBP Implementation Subcommittee
City of Norfolk Wetlands Board
City of Virginia Beach Wetlands Board
Coastal Management Project in Croatia
Coastal Project in the Adriatic
DEQ Academic Advisory Committee
ERP Sediment Restoration Partnership
Graduate Environmental Management Study
International Management of the North Sea
Joint Permit Application Revisions
TMDL Oversight Committee
VIMS Council Advisory Services Committee
VIMS Marine Science Day Planning Committee
Virginia Wind Energy Planning
York County Science Fair; Senior Division Judge

February
Aquaculture Management
Blue Infrastructure Project
CBP Scientific and Technical Advisory Committee
CBP Sediment Workgroup
City of Virginia Beach Wetlands Board
Consortium for Atlantic Regional Assessment
EAGLES Project
Elizabeth River Environmental Restoration Steering
ESI Mapping
International Projects and ICZM, B.Cicin-Sain Nanacoke Analysis Workshop
NC Collaboration Planning
Panel on Valuation of Aquatic Resources
VAWP Board Meeting
VDOF Stream Restoration
Virginia Coastal Policy Team
VIMS Marine Science Day Planning Committee
VMRC Habitat Management Advisory Committee
VMRC Monthly Commission

March
Association of State Wetlands Managers
Atlantic Estuarine Research Society
Builders for the Bay
CBP Scientific and Technical Advisory Committee
City of Virginia Beach Wetlands Board
Coastal Managers
DEQ Academic Advisory Committee
DEQ Technical Advisory Committee
EAGLES Project
ERP Board of Directors
Fairfax Parks Authority Huntley Meadows Advisory
Governor’s School Candidate Interview Committee
Integration Strategy Project
ICZM Plan for Croatia
Joint Permit Application Revisions
King William Reservoir
Middlesex County Wetlands Boards
Oyster Management Workshop
Technical Policy Committee
Tidewater Region Science Fair
TMDL In-House Committee
VAWP Certification Workshop
VAWP Tech Advisory Committee
VMRC Monthly Commission
Virginia Shore and Beach Preservation Association
Wetland Delineator Certification Workshop

continued
April
City of Portsmouth Wetlands Board
City of Portsmouth Wetlands Violation
Craney Island Expansion Mitigation Subcommittee
EAGLES SWR Workgroup
Elizabeth River Environmental Restoration Steering
ERP Monitoring Committee/Elizabeth River
Elizabeth River Restoration Trust Agreement
Elizabeth River Restoration Trust Board
EPA Grants Progress Report
Interagency Mitigation Bank Review Team
IOC/UNESCO - Coastal GOOS-Indicators for ICM
Kaufman Center Dedication
King William Reservoir
Living Shorelines
Sediment Remediation Partnership
TMDL In-House Committee
TMDL Oversight Committee
VAWP Board Meeting
VMRC Monthly Commission

May
4th World Fish Congress
Blue Infrastructure Project
CCRM QA/QC
CBP Scientific and Technical Advisory Committee
CBP Tidal Sediment Taskforce
CBP Urban Tree Canopy Workshop
City Manager on Paradise Creek Park
City of Portsmouth Wetlands Board
City of Suffolk Wetlands Board
Consortium for Atlantic Regional Assessment
CORPS Waterway on the Coast of VA
Depressional Wetlands Workshop
Eastern Shore Navigation
Eastern Shore Partnership
Elizabeth River Environmental Restoration Steering
ERP Board of Directors
Plum Point Park Dedication
The Coastal Society 2004
TMDL In-House Committee
VAWP Annual Membership
VIMS Marine Science Day
VMRC Monthly Commission
Voluntary Wetland Restoration Workshop

June
ArcGIS 9 Rollout Seminar
Builders for the Bay
Coastal Program Joint Meeting
CBP Implementation Subcommittee
CBP Scientific and Technical Advisory Committee
Chesapeake Bay Scientific Technical Advisory
City of Suffolk Wetlands Board
EAGLES Project
ERP Paradise Creek Stormwater Project
ERP Sediment Capping in Elizabeth River
Estuaries and Change Conference
James River Anadromous Study
King William Reservoir
Little Creek Wetland Pre-Design
Mid-Atlantic Hydric Soils Committee
Mid-Atlantic Wetlands Workgroup
TMDL In-House Committee
TMDL Oversight Committee
VAWP Board Meeting
VCP Integration Strategy Project
VMRC Monthly Commission

July
Albermarle-Pamlico National Estuarine STAC
Broad Creek Dredging
Builders for the Bay
City of Virginia Beach Wetlands Board
CBP Sediment Workgroup
CBP Shallow Water Monitoring Workshop
Craney Island Expansion Mitigation Subcommittee
ERP Technical Policy Committee
Nontidal Wetland Assessment
Tidal Wetlands Workshop
TMDL Oversight Committee
Virginia Coastal Policy Team

continued
August

Builders for the Bay
CBP Implementation Subcommittee
CBP STAC Executive Board
Consensus Document
EAGLES Project
Elizabeth River Environmental Restoration Steering
ERP Monitoring Committee
King William Reservoir
King William Reservoir Hearing In-House Prep
King William Reservoir Public Hearing
Longwood College Property Assessment
Lynnhaven River Planning
TMDL Oversight Committee
VAWP Board Meeting
Virginia Coastal Planning District Commission
VMRC Aquaculture Project Staff Briefing

September

APNEP STAC Executive Board
CBP Scientific and Technical Advisory Committee
City of Virginia Beach Wetlands Board Consensus Document
Craney Island Expansion NEPA
EAGLES Project
ERP Board of Directors
ERP Technical Policy Committee
Littoral 2004
Longwood College Property Assessment
VIMS Council
VIMS Outreach Coordination
VMRC Monthly Commission
Virginia Railway Express

October

Bruce Aitkenhead Advisory
Builders for the Bay: Lots Subcommittee
CBP Implementation Subcommittee
CBP Tidal Monitoring Assessment Workgroup
Coastal Management Toolbox

November

Consortium for Atlantic Regional Assessment
Interstate Seafood Symposium
TMDL Public Hearing
VAWP Board Meeting
VAWP Wetland Assessments
VMRC Monthly Commission

December

APNEP STAC Executive Board Meeting
Bogues Bay Spray Dredging Project
CBP Scientific and Technical Advisory Committee
CBP Sediment Workgroup
Craney Island Expansion Mitigation Subcommittee
Gloucester Point Ramp Rehabilitation
Mid-Atlantic Wetlands Workgroup
National Conference on Ecosystem Restoration
VAWP Board Meeting
VMRC Monthly Commission
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.
Program
Products
Coastal Inventory Program Products
Comprehensive Coastal Inventory Products 2004

Maryland Shoreline Situation Reports

- Baltimore County (including the City of Baltimore)
- Wicomico County
- Caroline County
- Dorchester County
- Somerset County
- Worcester County
- St. Mary’s County

Maryland Shoreline Surveys

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<td>Harford</td>
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<td>IP</td>
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<tr>
<td>Prince George</td>
<td>IP</td>
<td>X</td>
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</tbody>
</table>

X – Complete
IP – In Progress

Historic Bathymetric Mapping

- 19th century York River
- 18th century Potomac River

Contract Reports

- Coastal Managers Toolbox
- Blue Infrastructure
- Virginia Shoreline Classification - Phase I
- Maryland Shoreline Inventory - Interim Reports
- Maryland Shoreline Inventory (Phase 1) - Dorchester County
- Maryland Shoreline Inventory (Phase 1) - St. Marys County
- Maryland Shoreline Inventory (Phase 2) - Final Products
- Marina Site Suitability Tool - ArcIMS

Publications


Coastal Watersheds Program Products
Coastal Watersheds Program Products 2004


Wetlands Program Publications in 2004
**Wetlands Program Publications 2004**

The Virginia Wetlands Reports: [http://ccrm.vims.edu/vwrs.html](http://ccrm.vims.edu/vwrs.html)

Annual Summary of Permitted Tidal Wetland Impacts – 2003

Preserving The Bay’s Living Shorelines

VIMS Upgrades Shoreline Advisory Reports

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**VIMS Shoreline Permit Application Report #05-0020**

**APPLICANT:**
RON D. BLACKBURN
KINGDOM CORPORATION

**Locality:**
Kings Creek

**Immediate Waterway:**
GLOUCESTER COUNTY

**Watershed:**
MIDDLE PENINSULA BAYSHORE

**Purpose:**
Road Construction

**Application Type:**
Wetlands

**Site Inspection:**
1/21/05

**Report Date:**
2/8/05

**Type of Activity Proposed**

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<th>Project Location</th>
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<tr>
<td>Fill Brackish Water Mixed Community (Type XII) (ft²)</td>
<td>3000</td>
</tr>
<tr>
<td>Fill Subaqueous Bottom (ft²)</td>
<td>600</td>
</tr>
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</table>

**Total Impacts (ft²):**

- Wetlands: 0
- Subaqueous: 0
- Beach/Dune: 0

**Total Fill (ft²):**

3600

---

**The Virginia Wetlands Report**

**VIMS Upgrades Shoreline Advisory Reports**

By Karen Duhring

Many readers are probably familiar with the VIMS Shoreline Permit Application Report, also known as the “VIMS Report.” The Wetlands Program at the Center for Coastal Resources Management has published approximately 21,400 of these advisory reports between 1972 and 2003. VIMS scientists provide an independent, environmental assessment for almost every permit application in tidal waters by analyzing proposed activities in light of currently accepted guidelines and the best scientific information available. Alternative approaches are suggested if they will accomplish the project’s objectives with less environmental impact.

The first VIMS Report in the 1970’s was simple with a check box format to indicate if a project was basically acceptable or unacceptable from an environmental perspective. As the number and variety of permit applications increased through the 1980’s and 1990’s, the complexity and format of the VIMS Report also changed to keep pace. The Tidal Wetlands Database was improved in 1993 to systematically track impacts to marine resources throughout the Tidewater region and the format of the VIMS Report subsequently became more quantitative and detailed.

The first Geographic Information System (GIS) based format was introduced in 2001 through cooperation with the Comprehensive Coastal Inventory program at the Center for Coastal Resources Management (the Center). This program is responsible for comprehensive GIS shoreline resource inventories and updating these databases as new information becomes available. The professional expertise and on-site assessments of the VIMS wetland scientists are now complemented with desktop access to the Center’s GIS databases (coverages).

**Generating the Reports**

The process of generating each report involves the integration of five different components and software programs. The collection of GPS coordinates through County Supervisors or other sources is the first step. The GIS database is then used to determine the location and type of available wetlands in the vicinity of proposed activities. The VIMS Shoreline Advisory Report then integrates this data with the project’s location and purpose to provide a comprehensive environmental assessment for the project.

---

**The Virginia Wetlands Report**

**VIMS Upgrades Shoreline Advisory Reports**

By Karen Duhring

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Center Equipment Inventory
Laboratory/Field Equipment

Lab:
Videomicroscopy system
Trinocular stereomaster zoom microscope with an 88 mm working distance (small objects)
Trinocular stereomaster zoom microscope with an 56 cm working distance (large objects)
Fiberoptic light sources for stereoscopes (2)
Spectronic 20 spectrophotometer
Fisher Scientific Isotemp Muffle Furnace 550 series
Drying oven
Analytical balance

Field:
Kestrel 3000 Handheld Weather Meter
Palm Pilot Vx (4)
Palm Pilot m515 (3)
Palm Pilot Tungsten E (3)
Bushnell range finder
Cruz All Angles (11)
High resolution digital cameras
Teaching Marsh Remote Camera
Plankton pump
Plankton Splitter
100’ unguied, self-erecting tower for weather instrumentation
Tascam us122 Audio/ MIDI interface (Sound recorder)
Senheiser microphone me62 with K6 module

Fish:
Limnoterra Electronic Fishboard
Smith Root LR-24 electrofisher
Fyke nets (4)
Beach seine net
Otter trawl
Plankton net
Mesocosm nets (36)
Lift net (1)

Insects:
Malaise tent insect traps (4)
Blacklight insect traps (12)

Soil:
Soil compaction meter
SET table
Eckman Grab (2)

Water:
YSI 6600 Sonde units with probes for depth, temperature, dissolved oxygen, pH, conductivity/salinity and turbidity (6)
YSI 650 Multiparameter Display System connected to a YSI 6820 handheld probe for depth, temperature, dissolved oxygen, pH, conductivity/salinity and turbidity (2 each)
Remote solar powered acoustic tide gauge with cell phone data transmission system
RDS water level wells, programmable, recording (30)
Flowtracker Current Meter
General Oceanics mechanical flowmeter (3)
RDS Rain gauges, programmable, recording (8)
Tools:
- Trash pump
- Compressor
- Nail gun
- Reciprocating saw
- Dewalt circular saw
- Dewalt cordless drill
- Dewalt cordless circular saw
- Shop vacuum
- Laser level (2)

Survey Equipment:
- Trimble 4000ST survey grade, single frequency GPS units (3)
- Trimble Geo-Explorers, mapping grade handheld GPS units (7)
- Trimble 4700 geodetic grade, dual frequency GPS unit
- Trimble GPS base station
- Garmin GPS-12 (15)
- Garmin GPS-72 (3)
- TopCon Total Station survey system
- Marine Sonics side scan sonar (600 kHz)
- Marine Sonics side scan sonar (900 kHz)

Computing resources (fully networked system):
- 10 Unix workstation
- 28 NT pcs
- 2 100GB expandable RAID disk array
- AIT-1 tape back-up system with 10 tape changer
- 4 Numonics digitizing stations
- Canon 950 Color Copier
- Multi-user ArcInfo (University license)
- Multi-user ArcView (University license)
- ArcIMS
- ESRI 3D Spatial Analyst
- ESRI Spatial Analyst
- ESRI ArcPad
- Multi-user Erdas Imagine (Higher education lease agreement/University license)
- Multi-user Erdas Modules (Vector, Virtual GIS, Orthomax, Sub-pixel classifier)
- Visual Learning Systems= Feature Analyst software
- Mr. Sid

Vehicles:
- 2002 Dodge Dakota, crew cab, 4wd pickup
- 2003 Chevrolet Silverado 2500 HD, Crew Cab, 4wd pickup
- 2003 Ford Explorer 4wd
- 2005 Ford Escape
- John Deere Backhoe 790
- Old Town canoe