

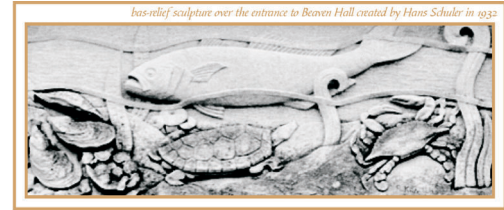
This is a summary of the history, mission and accomplishments of the University of Maryland Center for Environmental Science (UMCES). This summary has been prepared to provide a sense of where we have come from, what we are doing and where we are going. It also serves to identify the collaborative role UMCES plays within the University System and the State of Maryland.

UMCES HISTORY DATES BACK TO 1925

UMCES is a well established and mature institution. It traces its origin to the founding of the Chesapeake Biological Laboratory at Solomons in 1925, the oldest permanent, state-supported marine laboratory in continuous operation on the east coast. The addition of the Appalachian Laboratory in Frostburg (1961) and the Horn Point Laboratory near Cambridge (1973) have added diversity and depth to the Center. UMCES has had various locations and organizational positions throughout its history, but has always been administered as a separate unit. The independent administration of the Center has allowed it to develop highly successful and inter-disciplinary scientific programs that are responsive to State needs. UMCES is now composed of over 400 faculty members, staff and graduate students at its three laboratories and Maryland Sea Grant College Program.

Milestones for UMCES

- 1925** Chesapeake Biological Laboratory established
- 1941** Department of Research and Education created as independent state agency (legislative act)
- 1961** Natural Resources Institute created in moving the Department into the University of Maryland (legislative act), Appalachian Laboratory established
- 1973** Center for Environmental and Estuarine Studies (legislative act, 1975), Horn Point Laboratory established, 2 NRI laboratories closed
- 1997** University of Maryland Center for Environmental Science (legislative act to change name)
- 2000** Maryland Sea Grant College Program placed under UMCES administration



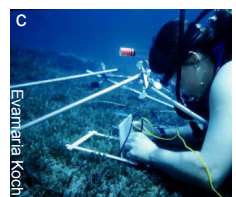
CHESAPEAKE BIOLOGICAL LABORATORY
75 years
1925 - 2000

Image: Poster created to celebrate the 75th anniversary of the Chesapeake Biological Laboratory. Image courtesy of Fran Younger.

UMCES HAS A BROAD MISSION

The mission of UMCES has been built upon fundamental legislative mandates. These statutory responsibilities are summarized as follows:

- Conduct a comprehensive program on research, education and public service directed at natural resource issues. Develop a predictive ecology for the improvement and preservation of Maryland's environment.
- Assist the development and coordination of multi-disciplinary environmental programs at public and private institutions at both undergraduate and graduate levels.
- Conduct research on the watershed and coastal environments, resources and organisms.
- Maintain liaison with the State on important regional environmental problems, prepare critical reviews and analyses, and apply UMCES resources to the needs of State agencies.
- Develop and promote environmental education throughout the State.



Images: a) SeaWiFS image of Chesapeake Bay b) Patrick Spain, an undergraduate student with the Research Experience for Undergraduates Program marking oyster spat c) Seagrass research d) Dr. Dave Secor showing a snakehead fish to the media e) Environmental education through the Living Classrooms Foundation.

UNIQUE DISTRIBUTED CAMPUS

UMCES has a distributed campus, and each laboratory has a distinct area of focus but there is a remarkable collaboration among laboratories. The UMCES faculty, staff and students are particularly adept at working across disciplinary boundaries, and most courses and research projects involve staff faculty at more than one UMCES laboratory and often in collaboration with other institutions. The **Chesapeake Biological Laboratory** focuses on fisheries, environmental chemistry and toxicology, and ecosystem studies. The **Appalachian Laboratory** addresses

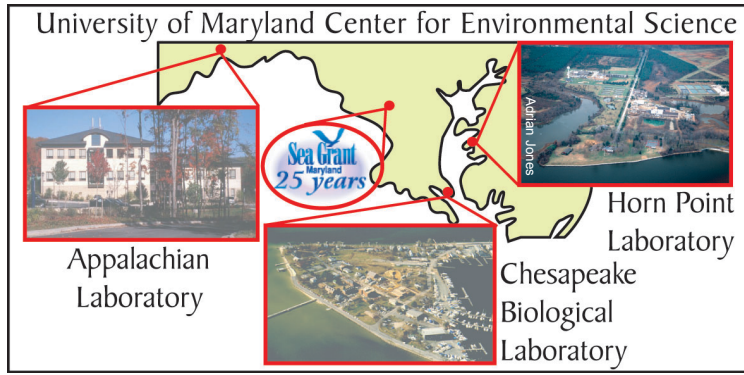


Image: Location of the 3 associated laboratories and Maryland Sea Grant.

terrestrial and freshwater environments, in particular landscape-scale studies of watersheds. The **Horn Point Laboratory** emphasizes oceanography, habitat restoration, and aquaculture. The **Maryland Sea Grant** is a conduit to federal research funding and translates research findings to those seeking technical information through its Outreach and Extension Programs.

UMCES has a decentralized structure with each laboratory and Sea Grant managed by a Director, who has responsibilities for direction of faculty and scientific staff, facilities operations and fiscal administration. UMCES Center Administration is based on the Horn Point campus and operates under the President and Vice Presidents for Administration; Development; and Science Applications. These officers have responsibilities for oversight and coordination of the laboratories and external representation to the University System of Maryland (USM) and clients and constituents. The Board of Regents and Chancellor have delegated responsibilities to the UMCES President that parallel those assigned by charter to the Presidents of the 11 constituent institutions. He is an active participant in the Council of University System Presidents and is currently serving as Interim Vice Chancellor for Academic Affairs.

UMCES also has recently reconstituted a Board of Visitors that advises the President on a variety of issues. The Board consists of prominent citizens from the region and is currently chaired by Governor Harry Hughes.

The Center is proud of its reputation among Regents, System officers, auditors and research sponsors as one of the best-managed institutions in the University System of Maryland.



NATIONALLY PROMINENT SCIENTIFIC DISCOVERY

One of the world's leading institutions for coastal studies, UMCES conducts innovative and vital research that spans the breadth of watershed to marine environmental sciences. Creative, high-impact research is the requisite contribution of the Center's faculty. UMCES has nationally prominent strengths in fisheries science, estuarine ecology, coastal oceanography and an emerging national prominence in watershed studies, environmental chemistry and toxicology.

Examples of scientific discoveries at UMCES

- Discerned the underlying factor for the bay-wide loss of aquatic grasses (nutrients)
- Elucidated the role of oysters in the ecology of the bay (biofiltration and biogeochemistry)
- Linked nutrient runoff to phytoplankton growth and decay leading to hypoxia
- Developed a fundamental understanding of scale issues in coastal ecology using experimental ecosystems
- Pioneered the use of novel techniques for remote sensing, in situ sensing and underway sampling to gain a better understanding of natural time and space variability
- Assessed the role of fish and other higher trophic levels in the ecology of the bay

UMCES has clearly achieved national eminence and arguably has attained the objective set forth in the 1983 plan for the University of Maryland. While such claims are easy to make and hard to document, several tangible indicators are offered:

- The 1995 external review of life sciences within the USM singled out the Center, referring to it as "...a first-rate research institute with an international reputation. It is one of the crown jewels in the University of Maryland System..."
- The UMCES faculty includes an unusually large number of current presidents of professional societies, editors of scientific journals, and coordinators of national research programs, reflecting high status and leadership within their fields.
- In its decadal ratings of U.S. doctoral research programs, the National Research Council ranked the Marine Estuarine Environmental Sciences program of USM (most oceanographers in MEES are UMCES faculty) in the top ten in oceanography in terms of quality of faculty and the highest ranked program focusing primarily on coastal oceanography.

Images: a) Dr Bill Van Heukelem holding a striped bass b) Dr Laura Murray and students replanting aquatic grasses c) Dr Court Stevenson collecting sediment cores in marshland d) Radiotagging a female Brown-Headed Cowbird e) Sea Grant Extension Agents replanting oyster beds f) Measuring soil carbon and nitrogen pools at Harvard Forest.

NEWLY CREATED INTEGRATION AND APPLICATION NETWORK

A major feature of UMCES is the focus on science integration and application. Science integration is an effort that goes beyond the generation and reporting of data - it is the attempt to synthesize and interpret the world in light of new scientific findings. Developing an integrated picture using disparate findings is often the most difficult challenge for scientists. Science integration typically requires input from a variety of disciplines, and a large part of the science conducted at UMCES is multi-disciplinary. Science application is an effort that goes beyond the scientific peer group - it is the attempt to conduct research that will have direct applications, particularly in resource management.



UMCES has recently established an Integration and Application Network (IAN). IAN is a collection of scientists who are interested in solving, not just studying environmental problems. The intent of IAN is to inspire, manage and produce timely syntheses and assessments on key environmental issues, with a special emphasis on Chesapeake Bay and its watershed. While IAN is an UMCES initiative, it will link with other academic institutions, various resource management agencies and non-governmental organizations. IAN will strive to facilitate the transfer of data from information into knowledge and ultimately into problem solving. We have dramatically increased our data gathering capabilities - it can be termed an "observation revolution." This increasing data gathering capability is analogous to trying to get a drink from a fire hose - the torrent of data particularly from remote sensing and in situ sensors, can be very difficult to turn into information. We are developing tools for information generation, for example modeling, geographical information systems, and other spatial analysis tools, but we also need to build knowledge out of this information through synthesis and visualization techniques. Ultimately we would like to apply this knowledge to problem solving, using an integrated and applied approach.

Examples of policies based on UMCES scientific integration and application

- The multi-state Chesapeake Bay restoration goals for nutrient reduction and recovery of underwater grasses
- Management actions leading to rapid recovery of striped bass stocks
- Restoration of streams receiving acid mine drainage
- Reduction of agricultural runoff to reduce the risk of toxic *Pfiesteria* blooms
- Management steps to alleviate overfishing of blue crabs
- Enhancing oyster habitat for the benefit of habitat restoration

EDUCATION AT A VARIETY OF LEVELS

UMCES has both a large and vibrant cadre of graduate students, premier undergraduate internships, and an active environmental education program for school children, and increasingly their teachers. At all of these education levels, UMCES has excelled. While UMCES is not a degree-granting institution, faculty participate in the Marine Estuarine Environmental Sciences Graduate Program (with various other campuses), the Toxicology Program (with University of Maryland, Baltimore), and Wildlife/Fisheries Biology and Applied Ecology/Conservation Biology (with Frostburg State University). Under the direction of UMCES professors, over 260 M.S. and 130 Ph.D. degrees have been awarded to students. Currently 147 students are conducting their graduate studies at UMCES laboratories. These students come from around the world and have unusually high academic qualifications. UMCES extensively uses the pioneering technology provided by the USM Interactive Video Network. UMCES faculty members have been able to play an increasingly important role in classroom instruction and research mentoring.

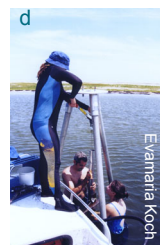
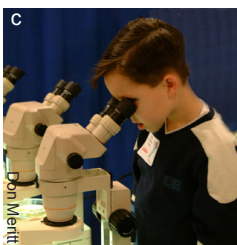


Image: Professor Ed Houde and Dr. Elizabeth North demonstrating the USM Interactive Video Network.

UMCES also contributes to undergraduate education within the USM, principally through summer research internships (approximately 30 per year) at its laboratories. For over a decade, Maryland Sea Grant has received NSF support to place top undergraduates from around the country in the Center's laboratories.

The Center operates an environmental education program, concentrated mainly at its Horn Point Laboratory, that annually reaches over 12,000 school children. Each of the laboratories has committed to working with K-16 teachers and reaches over 300 teachers per year. Some teachers even participate in summer research internships offered to Maryland secondary school teachers in support of continuing professional development in science and mathematics under the USM K-16 initiative.

Images: a) Student measuring oyster size as part of the Living Classrooms Foundation Program b) Jeanne Schoenfelder, a high school student conducting a research project as part of her high school graduation c) Youngster learning about oysters at the Junior Watermen's Show 2002 d) Graduate students conducting seagrass research e) Students collecting organisms in the field.



UMCES GROWTH AND ACHIEVEMENTS

The institutional growth of UMCES is largely a result of a) significant capital investment by the State during the 1990s and b) success of UMCES faculty in obtaining external funds through nationally competitive programs. In recent years, the majority of the UMCES budget is through grants and contracts, mainly for federally sponsored research. UMCES faculty are particularly adept at putting together large inter-disciplinary teams to address ever more complex issues. Approximately 40% of the Center's operating budget comes from general funds appropriated to USM. The Center has been the beneficiary of significant capital investment by the State during the 1990s, with the completion of the Coastal Chemistry Laboratory at CBL (\$7 million) and the Appalachian Laboratory (\$17 million). The new Aquaculture and Restoration Ecology Laboratory at the Horn Point Laboratory (\$25 million) is due to be completed in the summer of 2003.

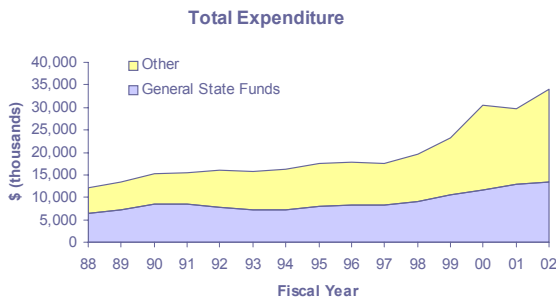


Figure: The total expenditure (in thousands of dollars) of UMCES over time, showing funds obtained from the State as well as external grants and contracts.

Based on National Science Foundation statistics (2000), UMCES was ranked 6th in the nation in terms of research and development expenditures in marine sciences. All of the larger institutions are engaged primarily in global ocean studies with expensive ship operations. Our Center is the largest in terms of expenditures for coastal marine research, which in this case does not include activities at our upland Appalachian Laboratory. UMCES is also ranked 12th nationally in environmental science, research and develop expenditures. These various rankings are a clear indication that the Center is among the most nationally eminent academic programs within the University System of Maryland.

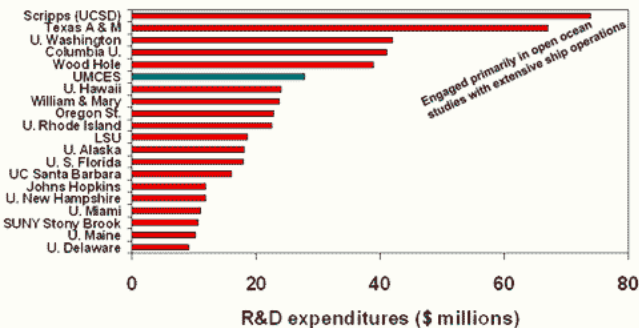


Figure: The relative national ranking of UMCES in terms of research and development expenditures.

Prepared for President Donald F. Boesch, Operating Budget Testimony, February 2003.



University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

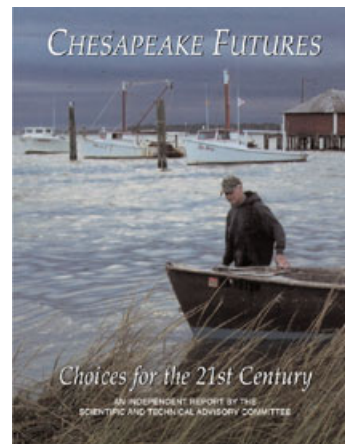
UMCES HAS A KEY ROLE IN THE FUTURE OF CHESAPEAKE BAY

The new Aquaculture and Restoration Ecology Laboratory building promises to keep UMCES at the forefront of science to further understand and restore the Chesapeake Bay. The building will be used for shellfish and finfish aquaculture, submerged aquatic vegetation and wetlands research enhanced with a large greenhouse. The Center is taking a proactive approach to restoring the Bay and its watershed because its



Images: The architectural plans for the new building located at the Horn Point Laboratory, Cambridge.

scientists are leaders, not followers. This is exemplified in the key role by UMCES faculty in producing the landmark report "Chesapeake Futures: Choices for the 21st Century." This



report outlines the likely consequences of choices we are making now, and their implications for the future of the nation's largest and historically most productive estuary. We will need more and better environmental science to help guide us through the challenges ahead, and UMCES will play a key role in the development of sound environmental practices.

Image: The "Chesapeake Futures: Choices for the 21st Century" report.

The Center is a widely recognized innovator in applying new technologies to environmental observations, visualization, and modeling. We are the lead institution for the NOAA-funded Alliance for Coastal Technologies of eight institutions throughout the U.S. On the land, we are applying remote sensing to understand how landscape patterns affect watershed functions. The UMCES Integration and Application Network that we have established is quickly becoming known as an outstanding model for bringing complex scientific information to bear on practical environmental problems.

CONTACT Donald F. Boesch: boesch@ca.umces.edu

FURTHER INFORMATION UMCES <http://www.umces.edu>
 Appalachian Laboratory <http://www.al.umces.edu>
 Chesapeake Biological Laboratory <http://www.cbl.umces.edu>
 Horn Point Laboratory <http://www.hpl.umces.edu>
 Maryland Sea Grant College Program <http://www.mdsg.umces.edu>
 Integration and Application Network <http://ian.umces.edu>
 Alliance for Coastal Technologies <http://www.actonline.ws>
 Chesapeake Bay Observing System <http://www.cbos.org>

PREPARED BY Dave Nemazie & Dr. Bill Dennison
 Design by Tracey Saxby