VIMS Research Helps Protect Navy Ships from Mines

VIMS scientist Dr. Carl Friedrichs is working with an international group of collaborators on a multi-year program to improve the state of the art in mine-burial prediction. The program is funded by the U.S. Office of Naval Research (ONR).

The technology of naval mines has far surpassed the floating powder kegs depicted in old war movies. Many of today’s mines lie in wait on the seafloor, then detonate when they sense acoustic or electromagnetic signals emitted by vessels passing far above.

Moore Goes with Flow to Monitor Water Quality and Seagrasses

A team of VIMS scientists led by Dr. Ken Moore is using new high-tech sensors to track Virginia’s commitment to the water-quality standards of “Chesapeake 2000.” This plan is the Chesapeake Bay Program’s most recent blueprint for Bay restoration and protection, with standards designed to give Bay organisms the clear, clean water they need to thrive.

Moore’s interest in water quality relates directly to his long-term interest in restoring the Bay’s submerged aquatic vegetation, or SAV. These underwater grasses once covered about 600,000 acres of Bay floor, providing key habitat for numerous species of fish, invertebrates, and waterfowl. But by 1978, only 41,000 acres remained. The decline, which has been documented by VIMS researchers using historical aerial photographs, is largely due to shading of the grasses by increased levels of sediment, nutrients, and algae in the water.

“Their block light in the shallows and can severely hinder both natural recovery and efforts to trans-

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Researchers use inert instrumented mines to study mine burial.

The University of Hawaii’s Dr. Roy Wilkens notes that mine-burial models must also be able to forecast on many different time-scales. “Questions raised by the Fleet might range from the probability of objects burying along a particular coast during a particular season, to what might happen to objects deployed along a known beach

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Yes Vote on Bond Referendum
Good News for VIMS

Virginians voted yes on November 5th 2002 to the bond referendum for higher education, which included $24 million for a new Marine Research Complex at VIMS. This new research space will change the face of VIMS, providing laboratories for programs critical to the future of Virginia’s coastal resources. Laboratories for seagrass restoration and research, hydrodynamic modeling, evolutionary ecology, benthic studies, shoreline studies, molluscan and crustacean toxicity, and political ecology, and toxicology will be moving from outdated 30-70 year old buildings to the new 70,600 sq. ft. research building or a 43,000 sq. ft. seawater laboratory.

Moore Goes with Flow
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plant SAV to formerly vegetated areas.”

Restoration of the Bay’s submerged aquatic vegetation is a primary goal of Chesapeake 2000. The plan calls for a three-step approach. The first is to restore underwater grasses to 114,000 Bay acres, the area they occupied in the early 1970s. SAV coverage will then be expanded into all areas that historical aerial photographs show once had SAV. The final step is to vegetate potential habitats to a depth of one, then two meters.

Moore’s Dataflow sensor is helping to identify areas in the James and York rivers where the water is consistently clear enough to support SAV growth at the depths defined in the Chesapeake 2000 plan. This task is difficult if not impossible using present monitoring sites and methods.

“Although water quality is monitored at fixed stations in mid-channel areas of the James,” says Moore, “we don’t have a good understanding of conditions in the shallower areas where seagrasses grow, or how water-quality conditions vary with space and time.”

The Dataflow system allows Moore’s team to monitor large expanses of deep and shallow water relatively quickly, allowing them to better understand how water quality varies from place to place, top to bottom, and month to month.

Dataflow is a compact, self-contained system that is deployed during monthly cruises from a small boat operating at speeds up to 25 knots. It collects surface water through a pipe on the bottom of the vessel, pumps it through an array of water-quality sensors, then discharges the water overboard. The sensors record dissolved oxygen, salinity, temperature, turbidity, and chlorophyll—all parameters that relate to water clarity, algal abundance, and seagrass health.

VIMS’ dataflow system was fabricated in-house by technicians Todd Nelson and Wayne Reisner.

Dataflow collects one sample every 2-4 seconds, which at an average speed of 25 knots provides a data point every 40-60 yards. It sends these data to a laptop computer, along with information on location and depth provided by an integrated GPS sounder. VIMS researchers Britt Anderson, David Wilcox, and Betty Neikirk synthesize these data to produce detailed digital maps that show how water-quality varies across a study site. Bay managers use these maps to evaluate efforts to reduce pollution in Virginia’s coastal waters, and to assess whether existing seagrass beds or designated restoration areas actually experience the conditions needed for seagrass survival.

To date, Moore’s team has used Dataflow to produce surface maps of water quality in the tidal portions of the York and James Rivers. Funding for the York River work came from the Virginia Department of Environmental Quality. EPA funded the James River work.

The Acrobat, a torpedo-like vehicle that is towed behind a larger boat, is another newly developed instrument platform. It provides a means to sample water-quality in deeper portions of the Bay. Still in its testing phase, Acrobat can be programmed to sample along an undulating course between the surface and deeper waters, thus providing a three-dimensional view of water quality.

Moore and the other collaborators on this project, including Drs. Iris Anderson, Larry Haas, and Howard Kator, are particularly excited about Acrobat’s ability to measure levels of dissolved oxygen in real time. “Deeper regions of the Bay often lack the levels of dissolved oxygen needed to support life,” says Moore. “Acrobat will allow us to map these zones and to understand how they expand and contract in relation to temperature, salinity, and depth.”

Dataflow data is available online through the Chesapeake Bay Program Office at www.chesapeakebay.net/data/index.htm