Resource-based Economy of Chesapeake Bay

Fisheries, aquaculture and marine recreation in Chesapeake Bay and the coastal ocean are important economic engines adding greatly to the economy of the Commonwealth of Virginia. Virginia’s commercial harvest ranks 3rd largest and 7th in total value nationwide. Research at the Virginia Institute of Marine Science (VIMS) shows that Virginia’s water-dependent resource-based industries, including commercial and recreational fisheries, shellfish aquaculture and recreational boating, annually generate $2.53 billion in sales and approximately $1.25–$1.5 billion in income, supporting over 20,000 jobs. Atlantic Sea Scallops are the East Coast’s most valuable commercial fishery, with Virginia’s fleet landing $56.8 million in 2012, the 3rd-highest value of any East Coast state.

Virginia’s shellfish aquaculture industry has expanded rapidly over the past few decades and the state now leads the nation in the culture of hard clams with annual sales exceeding $26 million. Oyster aquaculture in Virginia has grown rapidly within the past few years with annual sales approaching $10 million. In 2012, the economic impact of Virginia’s expanding shellfish-aquaculture industry approached $100 million. Research and extension provided by VIMS has played a central role in the development of this valuable industry.

Sustainably managing both wild-stock and aquaculture fisheries depends on sound science. Quantitative fisheries surveys conducted by VIMS serve as the basis for fisheries management decisions at the state and regional level. Research, monitoring, assessment, and modeling of blue crab stocks have led to the development of management approaches that have resulted in significant benefits to the wild stock and the fishery.

Oyster aquaculture is expected to continue to expand rapidly over the next several years, adding significantly to the region’s economy and to job creation. This expansion will also bring increasing resource-use conflicts among the multiple users of shallow water habitats. Tidal shallow waters contain shellfish beds, submerged grasses and other natural habitats that are valued for commercial fisheries and recreation. As all of these habitats undergo natural and man-made change, and as innovations in aquaculture allow for expansion, there will be continued need for sound science to drive resource management decisions. VIMS is recognized for its unique qualifications and proven effectiveness in conducting and extending vital research supporting these sustainable economic activities and the communities that rely upon them.
Chesapeake Bay Restoration

Despite improvements over the past few decades, Chesapeake Bay remains a stressed ecosystem, and the sustainability of its natural resource-based industries is dependent upon the success of long-term restoration efforts. Because water quality in the Bay is affected by activities that occur throughout its vast watershed, it is important that the Commonwealth commit to a robust, collaborative and effective partnership with all of the jurisdictions in the watershed to reduce pollution loads to the Bay. A new Chesapeake Bay Watershed Agreement is expected to be adopted in 2014. VIMS stands prepared to assist the McAuliffe Administration in developing effective science-based policy options and implementation approaches that support accountability and meaningful adaptive management of this national treasure.

Water Quality Modeling and Assessment— As the responsibility for meeting water quality improvement goals has increasingly shifted to local governments, it has become apparent that the monitoring data and models used to assess regional impairments lack the resolution to inform local management decisions. VIMS is uniquely positioned to assist the Commonwealth in overcoming these limitations. Decades of experience at VIMS in measuring toxins, nutrients, and other pollutants—together with the use of new robotic technologies and automated sampling platforms that offer real-time, high-frequency data—enable us to better characterize local water quality conditions and evaluate the effectiveness of management actions. We have developed unparalleled capabilities in the areas of water quality and ecosystem modeling and forecasting tools to support local policy decisions related to water quality improvement.

Living Resources— Restoration of living resources that contribute to and benefit from water quality improvement is a central component of Bay restoration. VIMS is in the forefront of providing the science and policy guidance underlying the restoration of oysters, finfish, submerged aquatic grasses and wetlands, as well as the development of living shorelines in Chesapeake Bay. VIMS scientists lead the way in conducting applied research on which most of these restoration efforts are based and—as part of our mandated role as an advisor to the Commonwealth—are instrumental in translating this science into policy.

Harmful Algal Blooms, Pathogens, and Human Health

In recent years, Virginia has experienced an increase in the frequency, duration and extent of harmful algal blooms (HABs). Commonly referred to as “red tides”, these HABs include species that produce toxins capable of harming other aquatic organisms and humans. HAB events have significant ecological, economic and human health consequences, including fish kills, beach closings and serious illness in humans. While the occurrence of HABs is tied to poor water quality, the detailed factors that lead to blooms are not well understood, underscoring the importance of establishing and maintaining a comprehensive monitoring, assessment, and coordinated notification program for Bay and coastal waters.
A related issue has been outbreaks of illness caused by shellfish-borne pathogenic bacteria, particularly *Vibrio* species. *Vibrio*-related illnesses traced to Virginia shellfish pose a significant threat to the sustainability of the wild shellfish harvest and aquaculture industries, as outbreaks can result in closures of growing and harvest areas, product recalls and negative publicity for the shellfish industries. The U.S. Food and Drug Administration (FDA) exercises regulatory authority over shellfish entering the food supply and could require implementation of post-harvest processing or a complete closure of Virginia's shellfish industries during the warmer months. VIMS is working closely with the FDA, Virginia's Department of Health and the shellfish industry to develop improved diagnostic tests for screening for pathogens and best management practices for avoiding outbreaks.

**Sea-Level Rise, Storm Surge and Coastal Vulnerability**

Rising sea level, coastal subsidence and increased frequency of severe storms threaten both natural and anthropogenic resources along Virginia's coastline. Regardless of the cause, the data are unequivocal: relative sea-level rise along Virginia's coast is among the most rapid in the U.S., exceeded only by the rates observed in the Mississippi delta region. This threatens ecologically critical shallow-water, intertidal and riparian habitats, and as well as infrastructure associated with private, industrial, municipal and military properties. Adaptation to rising seas requires reliable assessment of vulnerabilities and the development and implementation of effective science-based policies. While the effects of sea-level rise will be felt more acutely several decades in the future, decisions are being made every day in the Commonwealth by private landowners, state and local governments, industry and the military that affect their vulnerabilities to these threats. Providing decision makers at each of these levels with information on threats and policy options will provide significant economic, public health and safety benefits.

VIMS is working in the forefront of storm surge modeling to develop real-time, street-level predictive models to identify high risk areas in terms of critical infrastructure and economic impact. VIMS also develops shoreline-management plans for Virginia localities, and maintains a series of observation buoys (a collaborative effort between VIMS, Virginia Department of Environmental Quality, the National Oceanic and Atmospheric Administration and the Hampton Roads Sanitation District) that are used to provide real-time information, quantify storm impacts, and calibrate and refine our predictive models.

VIMS, in partnership with the Virginia Coastal Policy Clinic at the William & Mary School of Law, is leading the effort to provide local governments with practical guidance in dealing with sea-level rise in the Commonwealth's coastal communities.

**Offshore Energy Development**

Following the lease of the Virginia Wind Energy Area (WEA), momentum for the establishment of offshore wind energy continues with research, environmental assessment and a demonstration project in the WEA and adjacent research leases. There remains, however, a dearth of information on relevant geo-
physical conditions and living resources in the mid-Atlantic region, including the WEA and the nearshore environment between this area and Virginia’s coast. Nascent research and data gathering efforts are ongoing and more are being planned by federal, state, and private sources. VIMS is contributing to this effort by our continuing involvement with the Virginia Coastal Energy Research Consortium (VCERC) and through a fisheries assessment program—known as the Northeast Area Monitoring and Assessment Program (NEAMAP)—which targets the nearshore coastal ocean. VIMS is also preparing for expanded coastal ocean activities through the construction of a state-of-the-art, ocean-worthy research vessel.

No activities in the Virginia offshore oil and gas lease area are authorized in the current Bureau of Ocean Energy Management (BOEM) five-year plan (2012–2017); however, BOEM will be developing the 2018–2023 plan and a Programmatic Environmental Impact Statement (PEIS) in the near future. Interest remains strong in opening the Atlantic Ocean to oil and gas extraction, and Virginia will likely be an active partner in these efforts.

Although wind-energy farms, and potential future oil and gas wells, are not immediately adjacent to Virginia’s coast, the nearshore coastal ocean, the Bay and Virginia’s shorelines may be affected by these activities. VIMS is committed to continuing to delivering science-based information that supports sound decision making for these critical issues.

Meeting the Challenges

Effectively addressing these complex issues facing Chesapeake Bay and the coastal ocean is requisite for growing our coastal, natural resource-based economy. Doing so will require a commitment to keeping pace with new and emerging technologies to enhance data-collection capacity and remain on the forefront of predictive model development. Investment by the Commonwealth in robust monitoring and state-of-the-science modeling will reap significant economic benefits by helping to sustain our coastal economies, reduce risk to Bay’s natural resources, and more accurately assess the effectiveness of publicly-funded Bay restoration initiatives.

Each of the issues outlined in this document pose long-term challenges and opportunities for the Commonwealth. Each also figures prominently in policy decisions currently being made at both state and local levels. VIMS is committed not only to providing cutting-edge science on these issues, but also to effectively translate that science into policy guidance to ensure that we make wise use of our coastal and ocean resources.