

Estuarine Biota and Environmental Quality in Chesapeake Bay Tributaries

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Ecosystem-based strategies and concerns for natural resources are becoming important components of environmental status assessments and goal-setting in the management of estuaries and coastal systems. Recent emphasis on managing entire watersheds requires indicators of ecosystem stress applicable to watersheds ranging from major river systems and their estuaries to small creeks and embayments. The geographic scales of cumulative impacts resulting from non-point source pollution and urbanization generally are larger and less well-defined than the scales of point source impacts. Important considerations in developing and applying indicators of ecosystem integrity in coastal seas are: 1) the need for consistent, comprehensive, and long-term monitoring programs, especially for biotic resources; 2) the variability and open-endedness of coastal seas; 3) associating resource-based indicators with specific anthropogenic factors at watershed scales; and 4) gaining acceptance for novel measures of ecosystem responses. Multivariate indicators based on long-term monitoring of Chesapeake Bay submerged aquatic vegetation, fish, benthos, phytoplankton, zooplankton, and several habitat characteristics are being developed and applied, for example, in geographical targeting of non-point source pollution control efforts. We are exploring the capabilities of these indicators for supporting useful inferences about the causes of the observed responses. For example: fish species richness in bottom trawl samples in Chesapeake Bay tributaries appears to index and segregate effects of hypoxia and toxic sediments; an index based on trophic balance in fish assemblages is being tested as an indicator of excessive eutrophication. To link measures of ecological balance and function in coastal watersheds with management and regulation is a complex and stimulating challenge to scientists and managers.