Science and Management of Nutrient Loadings to Coastal Ecosystems

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In an effort to evaluate the influence of science on the formulation and implementation of environmental policy, the U.S. Academy of Engineers recently sponsored a symposium on "Environmental Regulation: Accommodating Changing Scientific, Technical and Economic Understanding." The symposium was based on 6 case studies in which parallel chronologies of scientific and management "events" were constructed and used to answer the question, "how and why does the management community respond (or not respond) to new scientific information?" Here I report on the results of the case study on nutrient loadings to surface waters in the Chesapeake Bay. Comparison of chronologies for the period 1965-1992 reveals lags on the order of 10 years between scientific discovery and management action and illustrate the significance of major environmental "events" and public involvement in overcoming inertia in the management process. Lags appear to reflect factors ranging from poor problem definition and a lack of consensus within the scientific and management communities to uncertainties inherent in the prediction of ecosystem behavior, the availability of cost-effective and socially acceptable solutions, and polarization of science and management communities.

Major events which preceded increases in management activity were Hurricane Agnes (1972) and the EPA Chesapeake Bay Study (1977-1983). The Bay-wide impact of Agnes alerted the public, decision makers and scientists to the vulnerability of the Bay as a whole to diffuse inputs from the watershed. Subsequently, the Bay Study focused public attention on the health of the Bay and engaged the science and management communities in a debate that would launch an unprecedented decade of research, legislative, and management activity. Analysis of the relationships between these activities shows that, although new scientific information rarely initiates management action, the availability of objective information generated through independent scientific inquiry is an essential ingredient to effective environmental management. Management action based on new scientific information requires a mix of public pressure, political leadership and consensus building within and among management and science communities (to better define environmental issues, agree on the status of scientific understanding, and establish measurable goals). Thus, the 1983 Chesapeake Bay Agreement committed the EPA, the states of Maryland, Pennsylvania and Virginia, and the District of Columbia "to improve and protect the water quality and living resources of the Bay system....;" and subsequent agreements in 1987 and 1992 respectively established the goal of reducing anthropogenic N and P loads by 40% and outlined a basin-specific strategy for achieving this goal by the year 2000.