



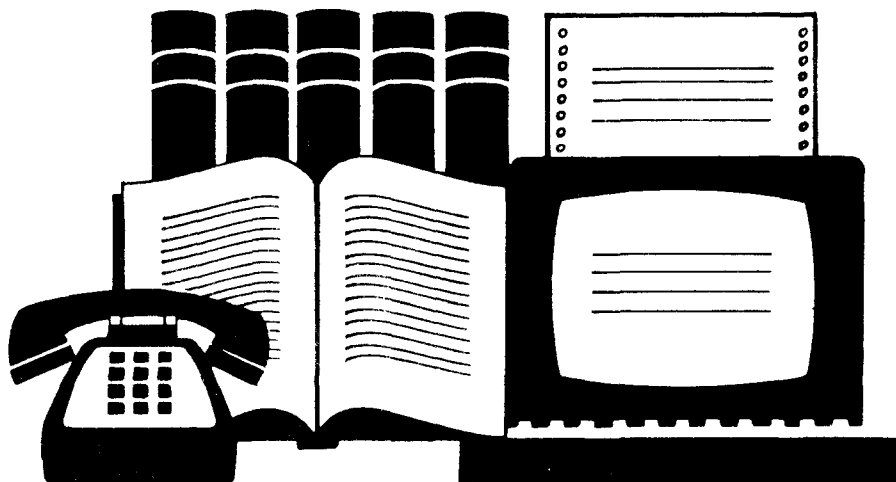
United States
Environmental Protection
Agency

Information Services
and Library
Washington DC 20460

EPA/IMSD-85-004
November 1985

Bibliographic Series

Estuarine Management Program



BIBLIOGRAPHY FOR AN
ESTUARINE MANAGEMENT PROGRAM

Revised Edition

November 1985

Headquarters Library
Information Management and Services Division
U.S. Environmental Protection Agency
Room 2904M Waterside Mall PM-211A
401 M St, S.W.
Washington, D.C. 20460
(202) 382-5922

U.S. Environmental Protection Agency
Region V, Library
230 South Dearborn Street
Chicago, Illinois 60604

U.S. Environmental Protection Agency

INTRODUCTION

This bibliography was prepared by Brigid Rapp, Head Librarian, at the request of the Director of the Office of Marine and Estuarine Protection. It is organized according to the following five basic steps for developing an estuarine management program: (1) management structure; (2) problem definition and assessment; (3) problem prioritization; (4) problem solutions; and (5) implementation. In many cases, the reports cited in this bibliography can apply to more than one category. Together, the reports represent the development of theory, research and action in estuarine management since 1970.

The citations include books, journal articles, reports and conference papers. Within the five topics, the citations are organized in alphabetical order by first author's last name, or if there is no author, by title.

Citations preceded by an asterisk are held in at least one of the twenty-eight EPA libraries. Citations not preceded by an asterisk can be borrowed from other libraries for EPA employees.

A comprehensive literature search using pertinent online databases was performed to compile this bibliography. In addition, we received valuable input from the Office of Marine and Estuarine Protection and the library at our Gulf Breeze, Florida, Laboratory. The citations were selected for their relevance to the EPA estuarine management program. There is a great deal more literature available on areas related to estuarine programs. For example, the EPA Region X library in Seattle, Washington has a bibliography on Puget Sound, a major estuary in that Region. Any EPA librarian can assist in identifying areas for research.

Whenever possible, a descriptive abstract is included with the citation. The source of the citation and abstract is noted by two letters enclosed in parentheses at the end of the entry. Those symbols represent databases searched to compile this bibliography. The key to those symbols follows:

(EN) Enviroline
Environment Information Center, Inc., 292 Madison Ave.,
New York, NY 10017

(GR) GeoRef
American Geological Institute, One Skyline Pl., 5205
Leesburg Pike, Falls Church, VA 22041

- (NT) NTIS
National Technical Information Service, U.S. Dept. of
Commerce, 5285 Port Royal Rd., Springfield, VA 22161
- (OA) Oceanic Abstracts
Cambridge Scientific Abstracts, 5161 River Road, Bethesda,
MD 20816
- (PA) Pollution Abstracts
Cambridge Scientific Abstracts, 5161 River Road, Bethesda,
MD 20816
- (WR) Water Resources Abstracts
Office of Water Research and Technology, U.S. Dept. of the
Interior, Washington, D.C. 20240

BIBLIOGRAPHY FOR AN
ESTUARINE MANAGEMENT PROGRAM

I. Management Structure

- *Armstrong, John Morrison, and Ryner, Peter C. Coastal Waters: a Management Analysis. Ann Arbor, Michigan: Ann Arbor Science, 1978.

An overview is presented of the factors that will be involved in the states' efforts to establish comprehensive management and planning programs for their coastal waters. Stress is placed on the spatial and temporal boundaries of coastal waters, rather than on the lands to establish a more balanced approach in future state coastal management efforts. Four major themes presented include the following: a description and analysis of existing bases of authority to manage coastal waters; a discussion of the Coastal Zone Management Act in terms of its utility for managing coastal waters; a presentation of some concepts for coastal water management, and a description of uses of coastal waters and their implications for comprehensive management. These uses are as follows: ocean dumping, fisheries management, national defense, deepwater ports, tanker safety, LNG, and outer continental shelf oil and gas development. (OA)

- *Armstrong, J. et al. Coastal Zone Management: the Process of Program Development. Sandwich, Massachusetts: Coastal Zone Management Institute, 1974.

The Coastal Zone Management Act of 1972 was enacted to encourage the coastal states to develop comprehensive coastal resources management programs which in turn would provide wise and effective management of the Nation's Coastal area. This document presents an in-depth discussion of the various elements of the act and attendant regulations that the States must consider in developing their own program. It is broken down into five categories: (1) substantive elements; (2) authority and organization; (3) organization and use of information; (4) public participation; and (5) estuarine sanctuaries. Substantive elements covered include boundary determination, permissible uses, geographic areas of particular concern, and priority of uses. The authority section considers the means of exerting control, organizational structures, and problems involved in designing organization capabilities. The information section includes a consideration of the types of information needed, and the use and sources of existing information. A discussion of the potential of public hearings as a tool for the generation of new ideas is presented in the public participation section. The estuarine section discusses National Ecological Units. (WR)

- *Carlozzi, Carl; King, Kathryn; and Newbold, Jr., William F. Ecosystems and Resources of the Massachusetts Coast. Boston, Massachusetts: Massachusetts Office of Coastal Zone Management, 1975. Sponsored by U.S. National Oceanic and Atmospheric Administration, Rockville Maryland. (Report no. NOAA-76121305; PB-263-411/1)

This publication discusses all the natural and many man-made systems making up the Massachusetts coastline, their importance as facets of the environment, and the ways in which they are used and altered by man. It has been prepared as a guide for all Massachusetts citizens to use in order to better enjoy and understand their unique heritage. The publication has been divided into four main sections. The first two parts present an overview of the natural forces and ecosystems respectively that form the productive basis for coastal resources. The next part describes man's use of coastal resources and the environmental consequences of man's activities. Finally the report analyzes important broad coastal ecosystems and their resource wealth, complexity, and environmental health. This last section considers needs for future scientific research and information tied to the management of Massachusetts' wealth of coastal resources. (NT)

- *Chasis, Sarah, Problems and Prospects of Coastal Zone Management: an Environmental Viewpoint. Coastal Zone Management Journal Vol.6, no.4 (1979): pp. 273+

The present National Coastal Zone Management Program is inadequate to protect U.S. Coastal Resources and does not effectively address the problems that Congress recognized when it passed the Coastal Zone Management Act of 1972. The need for a more effective Coastal Management Program is discussed. Current program management problems are identified. Recommendations to strengthen Coastal Zone Management are presented. (EN)

- *Clark, John, and McCreary, Scott. Prospects for Coastal Resource Conservation in the 1980s. Oceanus Vol. 23, no. 4 (Winter 1980-1981): pp. 22+

The Coastal Zone Management Programs implemented by various State governments exemplify the progress made in this field and illustrate needs for future management policies. Zoning, permit controls, and other land use controls have preserved ecologically sensitive shorelines and wetlands, while inadequate programs in other places have led to the erosion, pollution, and destruction of coastal ecosystems. Future management goals must encourage cooperation and mutual support of local, state, and federal agencies. (EN)

Evans, N., et al. Search for Predictability: Planning and Conflict Resolution in Grays Harbor, Washington. Seattle, Washington: Washington Sea Grant Program, Division of Marine Resources, University of Washington, 1980. (Report no. WSG 80-5)

In 1975 an experiment in coastal zone management began in Grays Harbor, Washington. The frequent conflicts which had occurred between government agencies, development interests, and environmental groups over shoreline development projects resulted in costly delays and great uncertainty about the use of the estuary. To resolve these disputes and avoid such conflicts in the future, agencies with decision-making responsibilities in the region formed the Grays Harbor Estuary Planning Task Force. The product of the Task Force effort, the Grays Harbor Estuary Management Plan, was to provide a management system to ensure that future uses of the Grays Harbor shoreline would be predictable. Now, by mid 1980, although some major agreements have yet to be reached, the Task Force effort is nearing completion. (OA)

Grindley, J.R. Problems in the Management of Estuaries. Fifth National Oceanographic Symposium, 24-28 January 1983. Grahamstown, South Africa: Rhodes University, 1983.

In recent years the need for conservation of estuaries has become widely recognized. However effective conservation often requires some degree of management and alternative management strategies favour different users. Questions of mouth opening salinity control, water level management and other issues create a series of practical problems for estuarine ecologists. (OA)

*Gusman, S., and Huser, V. Mediation in the Estuary. Coastal Zone Management Journal Vol. 11, no. 4 (1984): pp. 273-295.

Certain key disputes remained unresolved after extensive and for the most part successful efforts by the Columbia River Estuary Study Taskforce (CREST) to develop a management plan for the Columbia River estuary and its shorelands. The remaining disputes, involving conflicts between resource protection and port development, were resolved by the mediation process described in this paper. This process, involving exploration, process design, negotiation, and implementation phases, led to the signing of an agreement by twelve negotiators, the subsequent endorsement of the agreement by the federal, state, and local governmental bodies they represented, and the incorporation of the terms of the agreement into the comprehensive plans for local governments. The agreement describes the particular kinds of port-related development that might be appropriate at specific sites in the estuary and the conditions under which such development might take place. It also outlines areas where development alteration

would not occur. For some of the sites it presents constraints on dredge-and-fill activities, turning basin and navigation-channel depths and widths, corridors for pile-supported causeways and accessways, and mitigation policies. (OA)

- *Guy, William E. Florida's Coastal Zone Management Program: a Critical Analysis. Coastal Zone Management Journal Vol. 11, no. 3 (1983): pp. 219+

Florida has already enacted most of the state legislation needed for coastal zone management efforts. However, a review of the state coastal zone management plan shows that its effectiveness suffers from a lack of public and local government consensus. The various state agencies involved and the laws and regulations they administer are not well coordinated. While excellent local, regional, or state plans exist in many areas, they are often ignored in local government decision-making. (EN)

- *Jerome, L.E. Preserving the Nation's Wetlands. Oceans Vol. 16, no. 3 (1983): pp. 48+

The annual loss of estuarine habitat, between 1947 and 1967, has been estimated to range from 21 percent to 36 percent -- a rate at which our wetlands would totally disappear in 300 to 400 years. In 1972, the United States Congress passed the Coastal Zone Management Act (CZMA), administered by the Office of Coastal Zone Management (OCZM), under the National Oceanic and Atmospheric Administration. Five short-term goals are to: 1. gain a thorough understanding of the ecological relationships within the estuarine environment; 2. [develop] baseline ecological measurements; 3. monitor significant or vital changes in the estuarine environment; 4. assess the effects of man's stresses on the ecosystems and... forecast and mitigate possible deterioration, and 5. provide a vehicle for increasing public knowledge and awareness of the complex nature of estuarine systems. (OA)

- Klingeman, P.C. General Planning Methodology for Oregon's Estuarine Natural Resources. Corvallis, Oregon: Oregon State University, 1973. (OA)

- *Mieremet, R.B. Federal and State Coastal Zone Management Efforts Directed at Estuaries and Freshwater Inflow. Proceedings of the National Symposium on Freshwater Inflow to Estuaries, San Antonio, Texas, September 9-11, 1980. Washington, D.C.: U.S. Fish and Wildlife Service, Office of Biological Services, 1981. (Report no. FWS/OBS-81/04, Vol. I; PB82-131426)

Special area management planning, enforceable policies, and improved coordination are being brought to bear on the decisionmaking process. Mitigation and restoration projects can help alleviate some of the past problems. While coastal zone management has many significant tools which are being used and will be used in the future to address problems relating to freshwater inflows to estuaries, it obviously cannot cure

them all. Some states have included all or almost all of their State as the coastal zone because of the watershed principle, while others stop at the 5 ppt salinity line of the estuary. Extra efforts are needed to ensure good coordination of government actions. Coastal zone management often requires some compromises between preservation and development. (WR)

Narragansett Bay National Estuarine Sanctuary Management Plan. Providence, Rhode Island: Rhode Island Department of Environmental Management, 1983. Sponsored by U.S. National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management. (Report no. NOAA-83090702; PB83-262089)

In response to intense pressures on the coastal resources of the United States, Congress enacted the Coastal Zone Management Act in 1972. Four years later, the Act was amended to establish the National Estuarine Sanctuary Program. As stated in the Act, "...the purpose of the estuarine sanctuary program is to create natural field laboratories in which to gather data and make studies of the natural and human processes occurring within the estuaries of the coastal zone. This shall be accomplished by the establishment of a series of estuarine sanctuaries which will be designated so that at least one representative of each type of estuarine ecosystem will endure into the future for scientific and educational purposes. The primary use of estuarine sanctuaries shall be for research and educational purposes, especially to provide some of the management information essential to the coastal management decision-making process. (NT)

*Officer, C.B., et al. A Perspective on Estuarine and Coastal Research Funding. Environmental Science and Technology Vol. 15, no. 11 (1981): pp. 1282-1285.

There has been a dichotomy in approach to marine pollution problems between the research community and those responsible for environmental decision making. The net result has been that research carried on by government laboratories has often been restricted to immediate problem solving. The discussion in this article is divided into two parts: first, an examination of the affiliations of the individuals who have made recent contributions to estuarine and coastal research and of the sources of funding for that research and, second, a brief history of the past 10 years of estuarine research and some suggestions for procedural changes that might improve research results. (OA)

*Shabman, Leonard and Kerns, Waldon. Intergovernmental Management for the Chesapeake Bay: Emerging Issues and Alternatives. American Water Resources Association Unified River Basin Management Symposium, Atlanta, October 4-8, 1981. s.l.: American Water Resources Association, 1981(?): pp.369+ Traditional approaches to the design of intergovernmental organizations for watershed management have sought to instill

broad issue focus and authority in a single entity. Alternative approaches are being sought to improve regional management. A tiered institutional structure is emerging within the Chesapeake Bay area. Multi-issue agencies are being designed solely for policy coordination rather than program implementation. This technique offers potential for facilitating coordination of agency decisions across the watershed. Issues of water supply, water quality, and fishery management are addressed. (EN)

II. Problem Definition and Assessment

*Alabaster, J.S. Investigation of Acute Pollution Problems Affecting Fisheries in Estuaries and Coastal Waters. FAO Report: Pollutants in the Aquatic Environment; Detection, Measurement and Monitoring. s.l.: Water Pollution Research Laboratory, 1976. pp.56+

The main pollution problem for freshwater fisheries in the U.K. stems from the combined effect on rivers of sewage and industrial wastes in lowering the concentration of D.O. and raising that of poisons, principally metals (copper and zinc), cyanides, ammonia, and phenols. Short-term lethal effects of these conditions on trout can be reasonably well-defined from laboratory studies. The long-term effects of polluted streams on trout and other coarse fisheries remain to be determined. The lethal effects of mixtures of poisons and water quality fluctuations are discussed. An empirical relation between one predominant water quality characteristic's temporal distribution and the status of a fish population can be used to formulate water quality criteria, though other data are required. (EN)

Capone, T.E. and Armstrong, N.E. A Computerized Assessment of Environmental Impacts in an Estuarine System. Austin, Texas: Center for Research in Water Resources, Environmental Health Engineering Laboratory, Civil Engineering Department, University of Texas at Austin, 1981. (OA)

*Carter, Karen B., and Flynn, Kevin C. Pollution Control and the Chesapeake Bay. Water Pollution Control Federation Journal Vol. 55, no. 10 (October 1983): pp. 1218+

The Chesapeake Bay is both a delicate balance of freshwater and saltwater plants and animals, and the largest and most productive estuary in the world. For the last decade EPA has conducted a program examining the pollution problems in and around the Bay, and 1983 marks the first year that data from this program is to be used. Data will be kept up to date on the Bay's ecosystems. Any pollution problems will be controlled and eliminated as they arise. (EN)

*Chesapeake Bay: a Profile of Environmental Change. Annapolis, Maryland: U.S. Environmental Protection Agency, Chesapeake Bay Program, 1983. Sponsored by Delaware University, Lewes, College of Marine Studies; and CREST, Astoria, Oregon. (Report no. PB84-119197)

The report describes trends in water and sediment quality, and in the living resources of Chesapeake Bay. The water quality parameters evaluated include nutrients, dissolved oxygen, organic chemical compounds, and heavy metals. The living resources that were assessed include phytoplankton, submerged aquatic vegetation (SAV), benthic organisms (including shellfish), and finfish. Trends in water and sediment quality, and in living resources, including the interrelationships among these factors, were used to characterize the current state of the Bay. (NT)

*Chesapeake Bay: a Profile of Environmental Change; Appendices. Annapolis, Maryland: U.S. Environmental Protection Agency, Chesapeake Bay Program, 1983. (Report no. PB84-119205)

This document contains the four appendices to the report Chesapeake Bay: a Profile of Environmental Change and provides a characterization of the Bay's water quality and resources. (NT)

Coastal Zone Management Problems. Corvallis, Oregon: Water Resources Research Institute, Oregon State University, 1974. Sponsored by U.S. Office of Water Research and Technology, Washington, D.C. (report no. SEMN-WR-018.74; W74-12756; OWRT-A-999-ORE(16); PB-236-470/1)

The report describes the coastal zone, composed of the coastal plains, the continental shelf, bays, estuaries, lagoons and deltas as an area rich in natural resources and concentrated human activities. Lack of a comprehensive inventory of coastal resources, unbridled and poorly conceived development, increased population activities, uncontrolled harvesting of resources, and limited local financial resources to facilitate adequate provision of public services within the zone are among the problems plaguing the coastal area. Dredging and filling have particularly affected the environment through altered water circulation, physical removal of organisms, nutrient releases, and increases in turbidity, suspended solids, and heavy metal levels. One management technique is discussed, a diversity approach, which encourages clustering of development only within selected estuarine systems. (NT)

*Cronin, L. Eugene (ed.). Estuarine Research. N.Y.: Academic, 1975. 2 vols.

68 papers from a meeting of the Estuarine Research Federation at Myrtle Beach, South Carolina, October 1973.

*Cumberland, J.H. Economic Analysis in the Evaluation and Management of Estuaries. Estuarine Pollution Control and Assessment: Proceedings of a Conference, Pensacola, Florida, February 11-13, 1975. (Report no. EPA-440/1-77-007B; PB-265-467)

An economic-environmental systems model for analyzing estuaries which has been used in Maryland to forecast the quantities and types of waste and residuals which will be generated through the year 1985 for the Chesapeake Bay and each of its major tributaries is described. The model indicates that the amount of residuals will be a function of the rate and composition of economic development. Consequently, economic development and growth in the region can be expected to generate water quality problems of increasing magnitude for all estuaries in the U.S. Various corrective policy measures are evaluated for dealing with the environmental threat to the quality of estuarine waters. One of the most serious environmental impacts is aesthetic damage and methods are suggested for applying charges for various levels of aesthetic damage in order to encourage improved qualities of economic development. (WR)

Druery, B.M, et al. Engineering Approach to the Management of an Estuary. Fifth Australian Conference on Coastal and Ocean Engineering 1981: Offshore Structures. Barton, Australia: Institution of Engineers, Australia, 1981. pp. 111-112.

The main study objective was to carry out an engineering analysis of the estuarine processes to provide a sound engineering base from which responsible planning decisions could be made. The study included identification of the demands of the users of the waterway together with consideration of the requirements of land management authorities. The findings were presented within the following format: an assessment and quantification of the present and future constraints and opportunities offered by the waterway; engineering guidelines and comment on the development and management of the waterway and its environs. Guidelines were produced for: (a) investigations into the feasibility of any proposed engineering works. (b) land management decisions concerning the foreshores and environs of the waterway. (OA)

*Duda, Alfred M. Municipal Point Source and Agricultural Nonpoint Source Contributions to Coastal Eutrophication. Water Resources Bulletin Vol. 18, no. 3 (June 1982): pp. 397+

Several coastal rivers in North Carolina are facing serious water quality problems such as surface blooms of blue-green algae, fish kills from anoxic water, and red sore disease among fish. Point source and nonpoint source inputs of nutrients were investigated. The major factors contributing to water quality problems appeared to be agricultural activities like animal operations and cropland in watersheds with drainage improvements. (EN)

- *Elkington, John B., The Impact of Development Projects on Estuarine and Other Wetland Ecosystems. Environmental Conservation Vol. 4, no. 2 (1977): pp. 135+

The Council of Europe declared 1976 the Year of the Wetland in the hope of reaching a wider audience of sensitizing professionals engaged in management of estuarine areas, and of stimulating practical conservation projects. Such campaigns are not reaching decision-makers in the developing world, and are being ignored during the planning stages of a number of major projects that threaten the integrity of wetland ecosystems. Biology and pollution of estuarine wetlands, urban use of wetlands, impacts of agriculture, of tourism, and of recreation, wetlands laws, and conservation management of wetlands are discussed. (EN)

- *"Environmental Assessment of Water Quality Management Plans." Washington, D.C. U.S. Environmental Protection Agency, 1977. (Memorandum)

The function of a water quality management plan is to improve the physical environment. The preparation of an environmental assessment WQM plan is required under the Federal Water Pollution Control Act of 1972. Methods of assessing environmental impacts of alternative WQM plan elements are presented. Water quality and quantity, land use, air quality, ecological, economic, visual, and social impact assessments are described. (EN)

- *Estuaries, Geophysics and the Environment. Washington, D.C.: National Academy of Sciences, 1977.

As a result of increasing stress on U.S. estuaries from such activities as river flow alteration, dredging, tidal flat reclamation, effluent dispersal, and industrial cooling, scientists, engineers, government officials, and the public are becoming more aware of the need to protect estuaries. The principal problems that must be addressed to protect estuarine ecosystems are: The lack of understanding of the fundamental aspects of estuarine behavior--particularly, mixing and circulation; and the lack of a focal point for estuarine research. Aspects of estuarine science, especially the role of geophysics, are considered, and hydrodynamic and geological processes and basic chemical and biological phenomena are examined. Other topics explored include: longitudinal circulation and mixing relationships, lateral circulation effects, river plumes and estuary fronts, fjord and salt-wedge circulation, and turbulent processes. (EN)

- Ferguson, K.W. Human Activity and Slope Contribution of Sediments to an Estuarine Basin: Case Study; North River, Massachusetts. Ph.D. dissertation, Clark University, 1983.

Soil erosion on slopes adjacent to the North River

Estuary, Massachusetts and the ensuing estuarine sedimentation problems are the basis of this dissertation. Forest, agriculture and suburban land use patterns are selected for analyses of the soil erosion and sedimentation relations. The following field methods and laboratory techniques were utilized: (i) field reconnaissance, (ii) slope analyses, (iii) soil erosion plots, (iv) photo and map analyses, (v) botanical identification and delimitation, (vi) sediment sampling, (vii) field survey and mapping, and (viii) computer simulation. (OA)

- *Galloway, Jr., G.E. Assessing Man's Impact on Wetlands. Raleigh, North Carolina: North Carolina Water Resources Research Institute, 1978. (Report no. UNC-SG-78-17; NOAA-79070910; PB-298-736/0) Cosponsored by U.S. National Oceanic and Atmospheric Administration, Rockville, Md.

The first section provides a short background on Federal interest in wetlands and a discussion of how, when, and where man's impact on wetlands occurs. The next section focuses on impact assessment, first by defining the characteristics of a usable evaluation system and then by briefly surveying current evaluation techniques. The third section proposes the wetland evaluation system (WES), the author's concept of an evaluation system. The fourth section applies this model, for illustrative purposes, to abbreviated case studies of wetland evaluation in the Yazoo Basin of Mississippi and the Neuse River Estuary of North Carolina. (NT)

- *Hamilton, Peter, and Fucik, Kenneth W. Literature Review of Marine Wetland and Estuarine Water Quality and Ecosystem Models. Raleigh, North Carolina: Science Applications, 1980. (Report no. WES/TR/EL-80-5; AD-A088-656/4)

This literature review surveys published models of hydrodynamics, sediment transport, water quality, and ecosystems in estuaries and intertidal wetlands. The review was based on the needs and problems of the U.S. Army Corps of Engineers (CE) in the coastal zone as revealed by a survey of CE Field Offices with coastal responsibility. In addition, a workshop, conducted in New Orleans in June 1979, assessing the state of the art in understanding and modeling estuarine and wetland processes, served to define the scope of the literature review. (NT)

- *Hamilton, Peter. Survey of Marine Wetland and Estuarine Water Quality and Ecological Problems in Corps of Engineers Field Offices. Raleigh, North Carolina: Science Applications, 1980. Sponsored by Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Report no. WES-MP-EL-80-2, ADA088-171/4)

This report presents the results of a survey of Corps of Engineers (CE) field offices that have coastal zone responsibilities. The purpose of the survey was to investigate existing or anticipated water quality and ecological problems associated with CE activities in marshes

and estuaries. Emphasis was placed on identifying those problems amenable to analysis through application of predictive modeling techniques. The identified problems represent the perceptions of the field personnel as interpreted by Science Applications, Inc. In some cases, perceived problems have been extensively researched or are being presently studied. The survey was designed to identify problems perceived by the field offices and may not reflect current understanding. Three general problems were emphasized by all offices: (a) the uniqueness of the specific environments in their District; (b) water quality and environmental problems are functions of local concerns of the public; and (c) there is a need to evaluate efforts of a change in physical regime on an estuary. (NT)

*Haven, K.F. A Methodology for Impact Assessment in the Estuarine/Marine Environment. Livermore, California: California University, Livermore Laboratory, 1975. (Report no. W-7405-ENG-48; UCRL-51949)

The goal was to develop a model for assessing and evaluating the impact of present and future energy-related activities on the marine/estuarine environment. These impacts can be measured in economic terms by tracing the impact flow out of the economic sector through the marine environment and back into the economic sector in terms of changes in availability of natural resources. Two types of models are proposed; an ecological input/output model and a dynamic (difference equation) model. The ability to track lethal and sublethal, direct and indirect and short-and long-term effects of a variety of pollutants related to the production and use of energy resources is included in the acceptability criteria for the models. (WR)

*Hefny, Kamal. Land-use and Management Problems in the Nile Delta. Nature and Resources Vol. 18, no. 2, April-June, 1982, pp. 22+

The magnitude and rapidity of the changes taking place in the Nile Delta are discussed. This most vital part of Egypt's scarce, arable lands is also highly vulnerable. The system of agricultural and hydrobiological production depends on maintaining certain chemical and ecological balances, which are increasingly threatened by accelerated urban sprawl and the impact of water control projects. Management decisions about these complex problems should be based on continuing interdisciplinary study and monitoring of the Delta ecosystem. (EN)

*Helliwell, P.R. and Bossanji, J. (eds.) Pollution Criteria for Estuaries. New York: Halsted, 1975.

Howells, G.P. The Estuary of the Hudson River, U.S.A. Proceedings of the Royal Society of London, B. Vol. 180, 1972. pp. 521-534.

Although each estuary contains unique characteristics, studies of contrasting estuaries build up a body of knowledge defining estuaries as ecosystems and document existing conditions. A comparative approach allows economy of effort and direct attack on problems of management or control. Although the Hudson is a major river, utilized for drinking water, transport, sewerage, and recreation, it has been relatively neglected scientifically. Sufficient information is now available on the lower Hudson to formulate simple models usable for predictive purposes. Information about variety and abundance of flora and fauna is lacking. Water quality control may be needed if problems of fishery maintenance, eutrophication, and drinking water are to be avoided. The processes and pathways of pollutants within this estuarine ecosystem need research and study of effects on biological communities in relation to concentration and time of exposure. Great natural environmental variations exist in estuaries and the flora and fauna are affected by the need to tolerate these variable conditions. Capacity of estuaries to accept pollutants which enhance natural variations is relatively great. The best reconciliation between industrial development and maintenance of amenity needs to be determined. (WR)

- *Josselyn, Michael N., and Atwater, Brian F. San Francisco Bay Use and Protection (Physical and Biological Constraints on Man's Use of the Shore Zone of the San Francisco Bay Estuary). Washington, D.C.: American Association for the Advancement of Science, 1982. (AAAS report)

Physical and biological phenomena contribute to many of the hazards, boundary disputes, and environmental regulations that constrain shore zone development in the San Francisco Bay Estuary. Most common among geologic hazards is the instability of bay mud and peat under static loads. Providing safeguards against earthquakes is difficult because of uncertainty about fault locations and the magnitude of future quakes. Boundary disputes involving ownership and governmental jurisdiction often hinge on the evaluation of wetlands in historic or present times. Problems associated with erosion control and habitat preservation are also discussed. (EN)

- *Ketchen, K.S.; Bourne, N. and Butler, T.H. History and Present Status of Fisheries for Marine Fishes and Invertebrates in the Strait of Georgia, British Columbia. Canadian Journal of Fisheries and Aquatic Sciences Vol. 40, no. 7 (1983): pp. 1095-1119.

An historical account is given of the development of strait of Georgia commercial fisheries (other than salmon) from their beginnings in the middle to late 19th century to the 1980's. Where possible, attempts were made to explain past fluctuation in abundance, especially to distinguish natural effects from those of fishing or socioeconomic origin. The review deals with commercial exploitation of herring... and other invertebrates. (OA)

Marx, P.R., and Kraft, J.C. Application of a Model for an Estuarine Transgression to Coastal Planning Decision Making. Geological Society of America. Abstracts with Programs Vol. 13, no. 3 (1981). (OA)

*The Sancor Estuaries Programme, 1982-1986. s.l., South African National Scientific Programmes, 1983. (Report no. 67)

A description of South Africa's Estuarine Programme includes an outline of environmental problems resulting from human activities in estuaries, the current research being performed, and legislation that relates to estuaries. A program framework is developed that outlines research needs over the next five years. Research reports are divided according to the following types of research: biological, physical, chemical, geological, and aquaculture. (EN)

*Sheperd, P.N., and Ames, R.W. Management of Urban Development in Coastal and Estuarine Environment. Institution of Engineers, Australia. Civil Engineering Transactions Vol. 22, no. 1 (February 1980): p. 41+

Management of urban development in a coastal and estuarine environment in Southern Australia is evaluated. Specific problems that had to be overcome to produce an environmentally attractive and unique urban development are identified. Development costs are discussed. Regulation of private development by the Federal and local governments is described. (EN)

*Tarver, Johnie W., and Savoie, L. Brandt. An Inventory and Study of the Lake Pontchartrain-Lake Maurepas Estuarine Complex. New Orleans, Louisiana: Louisiana Wildlife and Fisheries Commission, Division of Oysters, Water Bottoms and Seafoods, 1976. Sponsored by U.S. National Marine Fisheries Service, Washington, D.C. (Report no. LWLFC-technical bulletin-19; NOAA-76111801; PB-262-413/8)

This study was made to investigate the composition, general distribution, and abundance of commercially or potentially important fauna inhabiting the Lake Pontchartrain-Lake Maurepas estuarine complex, so that comparisons with previously completed wetland research in Louisiana and the northern Gulf of Mexico might enable administrators to efficiently manage Louisiana's renewable coastal zone resources. Vertebrate and macroinvertebrate populations were sampled with a 16-foot trawl and 100-foot beach seine. Molluscan benthic communities were empirically determined utilizing a Peterson dredge. Zooplankton was estimated based upon collections accomplished utilizing a no. 2 mesh 1.8 x 0.5 meter net. Hydrological and climatological parameters were collected at four stations in addition to those coinciding with trawl, seine, Peterson, and zooplankton locations. Grain size determinations were made of the upper three inches of sediment samples during two separate sampling efforts--one in 1972 and another in 1973. (NT)

*Techniques for Evaluating the Effects of Water Resources

Development on Estuarine Environments. Austin, Texas: Texas Water Development Board, 1978. Sponsored by Texas Department of Water Resources, Austin; and U.S. Office of Water Research and Technology, Washington, D.C. (Report no. W79-03043; OWRT-C-4137 (9024)(1); PB-291-647/6)

This research project was designed to provide a set of analytical tools for water resources planners and decision-makers to assist them in measuring and evaluating the effects of water resources development on estuarine environments. The techniques are designed to be sufficiently flexible to analyze all types of water development and management policies. This report describes: (1) the techniques developed to measure the environmental impact of water resources development on estuarine environments, and (2) the application of these techniques to a prototype Texas river basin - estuarine system to demonstrate the approach of the methodology described and its efficacy. The methodology is tested through application to the Guadalupe and San Antonio River Basins and their associated estuary, San Antonio Bay. (NT)

*Terrell, Terry T. Physical Regionalization of Coastal Ecosystems of the United States and Its Territories.

Fort Collins, Colorado: U.S. Fish and Wildlife Service, Western Energy and Land Use Team, 1974. Sponsored by U.S. Environmental Protection Agency, Office of Research and Development. (Report no. FWS/OBS-78/80, PB-297-143/0)

A hierarchical regional classification scheme for partitioning coastal ecosystems of the United States and its territories based on the physical (mainly hydrological and geological) characteristics of those areas was formulated. Physical rather than biotic criteria were utilized so as to define whole ecosystems, rather than to define the distribution of a few species. The classification provides a data collection structure and delineates geographic zones about which predictions on the structure and functioning of ecosystems within these zones may be at various levels of resolution. Boundaries as defined by the National Wetlands Inventory were used extensively for landward and seaward limits. (NT)

*Tiner, Ralph W., et al. Wetlands of the United States:

Current Status and Recent Trends. Washington, D.C.: U.S. Dept. of the Interior, Fish and Wildlife Service, National Wetlands Inventory. For sale by the Superintendent of Documents, U.S. Government Printing Office, 1984.

The current status of U.S. wetlands and areas where they are in greatest jeopardy are revealed in a national survey. Major wetland types are identified, such as estuarine and palustrine systems, and their ecological importance is emphasized. These areas are valued for their wildlife, fishery resources, and water supply; wetlands also provide erosion and flood control as well as recreational opportunities.

An estimated 108.1 million acres in the lower 48 states were classified as wetlands in the mid-1950's; this number was reduced to 99 million acres in the mid-1970's. Agricultural development involving drainage was responsible for 87% of recent losses, while urban and other development caused 8% and 5% respectively. Regional and national problem areas are examined, and management recommendations are proposed. (EN)

- *Trickey, E.B., and Savage T.G. The Development of Estuarine Management Information through the Application of Biological Monitoring Techniques: A Case Study of the Mobile Bay Estuary. Estuaries Vol. 4, no. 3 (1981): p. 279.

Beginning in March 1980, the Alabama Coastal Area Board initiated a fourteen month study of the benthic community at eight sites in the Mobile Bay Estuary using the methodology developed in the Board's Pilot Study. The preliminary results thus far reveal a dynamic polychaete community in Mobile Bay/Mississippi Sound that varies seasonally. It is hoped that the full year's data will provide a baseline of present levels of polychaete organisms against which future trends in the composition and population of the polychaete community can be measured with understanding. (OA)

- *Vernberg, F.J. Comparative Studies of Tropical and Temperate Zone Coastal Systems. Bulletin of Marine Science Vol. 31, no. 3 (1981). pp. 801-808.

Although estuarine ecological systems are of proven importance to human society, estuarine studies tend to be site specific and restricted in scope. A vital need is research on the comparative dynamics of estuarine systems from different climatic regions to provide a better basis for developing a scientific understanding of their similarities and dissimilarities which is essential to developing a rational management program. One fundamental question is do the functional responses of coastal ecosystems differ between temperate and tropical zones in the same way the physiological responses of organisms differ between these zones. (OA)

- *Warinner, J.E., et al. An Assessment of Estuarine and Nearshore Environments. Gloucester Point, Virginia: Virginia Institute of Marine Science, 1975.

Estuarine and nearshore marine environments are described for the entire U.S., and an evaluation of water quality and pollution problems for the various regions is included. State and Federal law related to estuary protection is discussed. Estuaries as an economic resource are important as the home of diverse fish and waterfowl species. A potential conflict exists between domestic and foreign fishing fleets and between commercial and sport fishermen. Water use and supply projections are employed to predict the environmental impact of estuary use as an economic resource. (EN)

III. Problem Prioritization

McGuinness, Jr., W.V. The Delaware Estuary System, Environmental Impacts and Socio-Economic Effects: Annex to Volume I; Management Agency Problems in the Delaware Estuary. Newark, Delaware; Philadelphia, Pennsylvania: Delaware University and Academy of Natural Sciences of Philadelphia, 1973.

Major estuarine-related management areas and related problems in the Delaware estuary are identified and ranked according to societal priorities. Key managers were interviewed, and priorities were determined from their collective views. Management areas ranked as follows: highest-waste disposal; high-comprehensive planning and management, recreation, institutional and legal, and shipping; medium-commercial fishing, wetlands management, commercial land use, and residential land use; low-water supply, shore erosion, preservation and aesthetics; and lowest-sand and gravel extraction. Included is a problems matrix of four priorities, with fourteen problem areas listed for each. Under priority a, for example, is included abating unrecorded pollution, regionalization, unrecorded pollution loads, urban waterfront renewal, wetland values, biological implications, deep water ports, capability to support basic uses, land use management techniques, dredge spoil disposal, cost effectiveness in pollution control, attitudes and education, and translating research into action. Criteria for selecting the 56 problems included the number of interviewees who cited it, the emphasis placed on it, the stature of the interviewee, and the judged significance of not solving the problem. (WR)

McGuinness, Jr., W.V. Priority Management Areas and Problems in the Delaware Estuary: a Survey and Evaluation. s.l.: n.p., 1973. (OA)

*Osbaldeston, P.J. Control of Estuarine Quality in the United Kingdom. Water Quality Bulletin Vol. 5, no. 3, (July 1980): pp. 55+

Estuarine water quality characteristics and pollution control programs in the U.K. are surveyed. An estuarine classification system that characterizes these water bodies according to pollution status is explained. Sewage and wastewater treatment and effluent control systems have been implemented. Monitoring and research projects are also reviewed. (EN)

IV. Problem Solutions

*Bella, David A., Strategic Approach to Estuarine Environmental Management. American Society of Civil Engineering. Waterways, Harbors and Coastal Engineering Division Journal Vol. 101, no. 1 (February 1975): pp.73-92.

Ecological systems must be examined from a spectrum of views ranging from those of high perspective-low detail to

those of low perspective-high detail. Various concepts and approaches pertinent to the comprehensive environment planning for estuaries are developed. A high perspective-low detail view is employed to examine the organization, function, and requirements of whole estuarine systems. A planning approach calling for the uneven distribution of development activities among Oregon's estuarine systems is presented. A number of methods, concerns, and problems related to the implementation of this approach are identified. (EN)

- *Cheng, Ralph T. and Conomos, T.J. Studies of San Francisco Bay by the U.S. Geological Survey. Institute on Environmental Science Life Cycle Problems and Environmental Technology 26th Symposium. Philadelphia, May 12-14, 1980.

USGS is conducting a comprehensive interdisciplinary study of the San Francisco Bay estuarine system. The broad goals of this study are to understand processes and rates by which water, solutes, sediments, and organisms interact, and to develop and verify conceptual and numerical models of these interactions. Important sources and sinks of various chemical and biological constituents are being quantified, and relative importance of river inflow, wind, and tides as transport and mixing mechanisms is being determined. The data collection program is designed to provide data required for development of conceptual and numerical models. Near-monthly surveys of hydrographic properties in the main channels are being extended to include coverage in the broad shoal areas. In situ current-meters are being used to measure long-term circulations in the estuarine system. (EN)

- *Chesapeake Bay: a Framework for Action. Annapolis, Maryland: U.S. Environmental Protection Agency, Chesapeake Bay Program, 1983. (Report no. PB84-127729)

This report describes the present state of the Chesapeake Bay, the sources of its pollution and alternative pollution control options. It also recommends a range of actions to improve the Bay. (NT)

- *Chesapeake Bay: a Framework for Action; Appendices. Annapolis, Maryland: U.S. Environmental Protection Agency, Chesapeake Bay Program, 1983. (Report no. PB84-127737)

This document includes the seven appendices to the report Chesapeake Bay: A Framework for Action. The report and its appendices describe the state of the Chesapeake Bay, pollutant sources and loadings, and alternative management strategies for improving the environmental quality of the Bay. (NT)

- *Chesapeake Bay Program: Findings and Recommendations. Philadelphia, Pennsylvania: U.S. Environmental Protection Agency, Region III, 1983.

Chesapeake Bay Study: Summary Report. Baltimore, Maryland:
U.S. Army Corps of Engineers, Baltimore District, 1984.

- *Diener, Richard A. Man-Induced Modifications in Estuaries of the Northern Gulf of Mexico: their Impacts on Fishery Resources and Measures of Mitigation. Paper presented at the American Fisheries Society, et al. Mitigation Symposium, Ft. Collins, Colorado, July 16-20, 1979.

The commercial and sport fisheries of the Gulf of Mexico are heavily dependent on the estuaries of the Northern Gulf Coast. Several anthropogenic modifications in these estuaries--including dumping of toxic wastes and agricultural pesticides, and landfilling of estuaries for residential and industrial sites--are threatening these resources and the quality of the supporting habitat. Potential impacts of each type of modification on the habitat and resource are identified. Mitigative measures that may be taken to offset these impacts are discussed.
(EN)

- *Fruh, E. Gus; Penumalli, B.R., and Flake, P.H. Establishment of Operational Guidelines for Texas Coastal Zone Management: Special Report I: Water Quality Modelling and Management Studies for Corpus Christi Bay: a Large Systems Approach. Austin, Texas: Division of Natural Resources and Environment, Texas University at Austin, 1975. Sponsored by National Science Foundation, Research Applied to National Needs, Washington, D.C. (Report no. NSF/RA/E-75/054; PB-247-458/3)

The study considers a large systems approach to the problem of estuarine water quality modelling and management. The steady state estuarine water quality model is formulated as a large scale matrix. This model has a simple structure that is ideally suited to optimization methods for quantitative water quality management analysis. The approaches developed here have been applied to Corpus Christi Bay on the Gulf Coast of Texas. The objective was to minimize the total cost of treatment, and the corresponding variables of optimization were the levels of treatment to which various sources have to be treated. Four optimal policies for quantitative water quality management corresponding to different constraint conditions are determined for Corpus Christi Bay. (NT)

- *Jaworski, Norbert A., and Villa, Jr., Orterio. A Suggested Approach for Developing Estuarine Water Quality Criteria for Management of Eutrophication. Duluth, Minnesota: U.S. Environmental Protection Agency, Environmental Research Laboratory, 1981. (Report no. EPA-600/J-81-567; PB82-224049). Published in Estuaries and Nutrients, 1981, pp. 499-516.

A conceptual approach for developing water quality criteria for eutrophication management is suggested. The three basic components of the framework include source ambient relationships, effects, and impact analyses. The approach focuses on a conceptual method for developing decision-making criteria as

opposed to the classical water quality criteria of a single value of limitation. The approach to developing water quality criteria for eutrophication management provides an analysis framework of response relationships which can be readily incorporated into water quality standard-setting processes that include environmental considerations and technological and economic factors. (NT)

- *Johnson, M.S. and Eaton, J.W. Environmental Contamination through Residual Trace Metal Dispersal from a Derelict Lead-Zinc Mine. Journal of Environmental Quality. Vol. 9, no. 2 (April-June, 1980): pp. 175+

A study of historic and current environmental problems near a derelict lead-zinc mine in North Wales shows that heavy metal dispersal occurs through contaminated mine drainage waters and episodal erosion of an unstable tailings dam. Since discontinuation of mining operations, an estimated 13,000 metric tons of metalliferous spoil have been eroded from the mine tailings dam. Extensive contamination of lowland agricultural pastures, streamwater pollution, and significant contamination of the flora and fauna near the mine are discussed. Stabilization measures have been initiated as a safeguard against further degradation of natural resources in the area. (EN)

- *Kapetsky, James M. Some Considerations for the Management of Coastal Lagoon & Estuarine Fisheries. New York: Unipub, 1981. (Fisheries technical papers, no. 218)

- *Kelley, Don W. San Francisco Bay Use and Protection (Solving the Delta Problem) Washington, D.C.: American Association for the Advancement of Science, 1982. (AAAS report)

Major ecological problems have been caused in the San Francisco Bay Estuary and Delta Region by the effects of upstream river diversions and other water resource development projects. Two solutions to the problems of reduced freshwater outflow and declining fishery stocks are outlined. The first is to stop the diversion of water from the Delta, or reduce it to low levels. The other alternative involves the effective design and operation of the peripheral canal to export water around, instead of through, the delta. (EN)

- *Lambert, Walter P., and Fruh, E. Gus. Methodology to Evaluate Alternative Coastal Zone Management Policies: Application in the Texas Coastal Zone; Special Report III: A Methodology for Investigating Fresh Water Inflow Requirements of a Texas Estuary; Volume I. Austin, Texas: Texas University at Austin, Center for Research in Water Resources, 1976. (Report nos. NSF/RA-760258, PB-259-182/4)

The study addresses the water resource management problem of determining fresh water inflow requirements for a Texas estuary. A computer-oriented methodology provides a general, rational approach to the inflow problem without being dependent upon specific machines and computer programs. Viability of

the methodology is demonstrated by the use of existing computer models within an estuarine management scenario developed for Corpus Christi Bay, Texas. The methodology has a two-step structure: step 1 translates qualitative, ecologically-oriented management policy goals for an estuary into a set of net fresh water inflow requirements. Execution depends on the identification of a set of indicator organisms which characterize the desired estuarine environment. Step 2 produces the set of upstream fresh water release schedules required. (NT)

- *Lambert, Walter P., and Fruh, E. Gus. Methodology to Evaluate Alternative Coastal Zone Management Policies: Application in the Texas Coastal Zone; Special Report III: A Methodology for Investigating Fresh Water Inflow Requirements of a Texas Estuary; Volume II: Appendices. Austin, Texas: Texas University at Austin, Center for Research in Water Resources, 1976. (Report nos. NSF/RA-760259, PB-259-183/2)

This volume contains the five appendices to this report: area study; calibration, verification, and sensitivity analysis of HYDTID and LOTRAN; computer programs; selected computational procedures; a compendium of experimental results generated during execution of the illustrative application of the investigative fresh water methodology. An extensive bibliography is included. (NT)

- *Spofford, Walter, O.; Russell, Clifford S.; and Kelly, Robert A. Environmental Quality Management: An Application to the Lower Delaware Valley. Washington, D.C.: Resources for the Future, 1976. (Research report 1)

A study of residuals management in the lower Delaware Valley was undertaken. Gaseous, liquid, and solid residuals were observed. Different methods of allocating the distribution of costs and environmental quality that could be useful in making both legislative and business decisions are presented. Ambient standards can thus be met through varying combinations of strategies to distribute costs efficiently among the public and private sectors, among the various subregions, and among different income groups. (EN)

- *Wallis, I.G., Options for Improving Water Quality. International Journal of Environmental Studies Vol. 6, nos. 2/3 (1974): pp. 107-120.

The wasteload, which is the sum of all the different wastes present, determines water quality. An expression for the wasteload is derived in terms of five major factors -- the number of people living in the watershed, the per capita waste generation, the waste treatment efficiency, the distribution of waste and the capacity of the receiving water to assimilate waste. To improve water quality, the waste load must be reduced. The possible options for reducing the wasteload are determined by examining the means of reducing each of these factors. The algebraic expression obtained for the wasteload shows the relationship between changes in the

different control options and the resulting change in water quality. It is concluded that cooperation between national, regional and local authorities is necessary if all waste control options are to be used, but the regional scale provides the greatest opportunity for using these options and hence more flexibility for attacking water quality problems. (WR)

- *Yamauchi, H., Economic Evaluation of Subtropical Bay from the Standpoint of Water Quality Management. Advances in Water Pollution Research: Proceedings of the 5th International Conference. s.l. n.p., 1970.

Kaneohe Bay is used as a typical case of estuarine pollution in Hawaii. Cost-benefit analysis is applied to water quality management decision-making. To estimate socio-economic values, an attempt was made to monetarily quantify two of the more significant uses of the Bay (as a bait fishery and as a recreational resource). These dollar values were to be related to the physical baseline conditions of the Bay and then weighed against the costs of alternative methods of abating discharges into the area. Three approaches for evaluating the Bay as a bait fishery are discussed yet no satisfactory value of bait was established. However, an upper limit was set and some difficult issues were isolated. There are also problems in assigning dollar values to the recreational activity occurring in the area since such activities have, by nature, extra-market values. Alternative methods for controlling waste discharges into the Bay are elaborated and the least cost alternative was computed. Substantial cost savings can be realized by widening the range of physical and institutional alternatives from which to choose. (EN)

V. Implementation

- *Davis, Gordon E. Special Area Management: Resolving Conflicts in the Coastal Zone. Environmental Comment (October, 1980): pp.4+

The proposed Coastal Zone Management Act amendments of 1980 call for the preparation of special area management plans that provides for increased specificity in protecting significant natural resources, reasonable coastal-dependent economic growth, improved protection of life and property in hazardous coastal areas, and improved governmental decision-making. In Coos Bay, Ore., special area management, as envisioned by the amendments, has evolved. The physical and political context of the Coos Bay program are outlined. The principles and techniques required to implement a special area management program are examined. An example of how the question of using a large freshwater marsh for future industrial lands was resolved within the planning process is cited. (EN)

Griggs, N.S. Experience in Estuarine Water Quality Management. Water International Vol. 7, no. 4 (1982): pp. 148-152.

Management of water quality in estuaries is complicated owing to the diversity of sources of pollution and the complex natural phenomena involved. Moreover, estuaries often involve several jurisdictions of local, regional and provincial governments of several states, which may complicate agreements of actions plans. Action plans to improve water quality in estuaries can be based on similar principles. The main purpose of this paper is to examine a case study in the United States where such an action plan for estuary restoration has been implemented, with considerable political support. Despite the support and a great deal of scientific attention, significant difficulties persist. In order to make further progress, additional sums must be invested in research and investigations. (PA)

*Hull, C.H.J. Implementation of Interstate Water Quality Plan. Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers Vol. 101, no. HY/3 (March 1975): pp. 495-509. (Paper no. 11177)

The water quality control plan of the interstate Delaware River Basin is part of a multifunctional master plan for water resources conservation, development, and management in the 13,000-mile, four-state region. The master plan, or comprehensive plan, is required by the Delaware River Basin Compact and has the force of law. No project or development affecting the water resources of the basin can be undertaken if it is in conflict with the comprehensive plan, which includes policies, standards, criteria, and general goals, as well as physical projects and facilities, deemed necessary by the Delaware River Basin Commission for the purpose of the Compact. The water quality plan is being implemented by the basin community under the guidance and regulatory control of the Commission. Compliance is effected by: mandatory consultative planning between the Commission and sponsors of projects that may influence water quality; and formal detailed review of water-related projects before construction approval is granted by the Commission. (WR)

*Levinson, Amy, and Hess, Jeffery. Conservation and Development in Oregon's Coastal Zone. Coastal Zone Management Journal Vol. 4, no. 1-2 (1978): pp. 97+

Coastal zone management in Oregon is dealt with through the State's general land use law, which also regulates population increases, urbanization, and preservation of agricultural land. A commission having primarily local membership was established to develop policies, studies, and recommendations about coastal management. The findings of the commission were assembled into a proposed coastal management plan, and the staff of the commission was absorbed into the state land management agency. In compliance with the Coastal Zone Management Act of 1972, the Oregon plan is now undergoing

federal review. With state adoption of the plan, deadlines for implementation were set for local compliance. Some opposition to the plan has surfaced. (EN)

Noonan, D.C.; Rosenberg, M.S.; and Wood, D.W. Constraints to Managing Interstate Aquifer. Journal of Water Resources Planning and Management Vol. 110, no. 2 (1984): pp. 191-205.

Many considerations exist when attempting to manage a ground water system that flows across interstate boundaries. The legal, institutional, and technical constraints managing one such system, the Coastal Plain Aquifer System of the Delaware River basin, are described. A groundwater management plan aimed at addressing the two biggest threats to the quality of the interstate aquifer system, synthetic organic contamination and salinity intrusion, is presented. The recommended plan includes provisions for locating future groundwater withdrawals away from stressed areas; developing a surface water supply as part of a conjunctive use scheme; and developing new well fields in the phreatic portions of unstressed areas. The plan also contains a set of policy recommendations aimed at addressing legal and institutional problems. (GR)

*Taylor, L.E. Environmental Aspects of Water-Resources Planning in England and Wales. Journal of Hydrology Vol. 51, nos. 1-4 (May, 1981): pp. 232-243.

The Water Resources Act of 1963 provides the framework for the comprehensive management of water resources in England and Wales. This paper discusses the resultant management procedures which have facilitated consideration of regional schemes including river regulation, inter-river transfers, and freshwater storage in estuaries. The environmental aspects of these representative regional schemes are discussed with particular reference to a feasibility study of freshwater storage in the wash. Multipurpose Regional Water Authorities created in 1974 consider water resources schemes within a framework of priorities for other water services. While it is necessary to consult the public on alternative water strategies, it is also necessary to ensure that resources are developed in time to meet increasing demands. It is suggested that environmental evaluation of water schemes is more appropriate for England and Wales than formalized environmental impact assessment, which often results in the presentation of extensive data, some of which is subjective and much of which appears to be of doubtful use to planners. (WR)

U.S. Environmental Protection Agency
Region V, Library
230 South Dearborn Street
Chicago, Illinois 60604