GOVERNING CHESAPEAKE WATERS

A History of Water Quality Controls on Chesapeake Bay, 1607-1972

by

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FOREWORD

The Chesapeake Bay has been called the most-studied and best understood estuary in the United States. Yet is is practically unexamined in the areas of the social sciences and the humanities. While tens of millions of dollars have been spent on producing the thousands of studies that examine the physical, biological, chemical, and engineering aspects of the Bay, little attention (and no money) has been given to understanding the political, cultural, and economic character of Bay governance. The many planning documents, of which the Corps of Engineers' Chesapeake Bay Study is the largest, are general compilations of information and issues rather than original pieces of research.

As a result, the present study has had the benefit of little scholarship to point the way. For example, there is nowhere even a simple compilation or listing of the state agencies that have been involved with the Bay over time. The records of what government has been doing with the Bay, written as they are in varying documents, and scattered in various libraries in both Virginia and Maryland, have not found their way into the numerous bibliographies that have been assembled for the Bay. And the relationship of the governments of both states to the Bay is imperfectly documented. In Virginia, the State Water Control Board did not produce annual reports until 1972, the cutoff date for this study. In Maryland, the reports of water quality agencies tend to be perfunctory and repetitive, and give little indication of the real issues facing the agencies over the years. The researcher is forced to approach his material as though he were an archeologist, finding a few shards here, a few bone fragments there. Piecing together a coherent story out of the fragments requires a certain amount of logic, a workable hypothesis about the overall nature of the creature to be described, and some theories about how the evidence fits together.

This report has relied primarily on written sources. Those proving most fruitful have been the annual reports of various state agencies, the occasional reports of study commissions and blue ribbon panels, and the codes, statutes, and case law of the two states. Agency files proved difficult to use because they are boxed and stored, full of irrelevant material, unorganized, and uncataloged.

Interviews with persons familiar with Bay issues have given

a general orientation to a particular period, and suggestions of topics or sources for further research. We have not attempted to get detailed information of specific events through such interviews. The written record, we feel, stands on its own.

Use has also been made of the abundant collections of newspaper files in libraries. While newspaper articles may have questionable accuracy, they identify key issues and place them definitively in time. Without them, numerous controversies, left only to the official archivists, would go unrecorded. In this study, information from newspapers gives a sample of issues, and shows the broad trends in water quality awareness.

Another useful sources has been feature articles in magazines and newspapers. These are particularly useful, because they both reflect, and partially shape, the public attitudes toward the Bay. Changes in these attitudes provide data used throughout the report.

Last, the personal experience of John Capper has been drawn on. Mr. Capper worked as a planner for the Department of Chesapeake Bay Affairs of the State of Maryland from 1968 through 1972.

The authors hope that this report has something to say that has been inexplicably neglected in the public debate over the Bay. After all, the issue of the quality of Chesapeake Bay is a matter not primarily of science but of public opinion, and how that opinion is expressed in the political process. Therefore, if one is concerned about the Bay, one will attempt to understand the human-political side of the Bay system as well as the physical-biological side. This does not mean that scientists should be involved less in research on the Bay. It simply suggests that economists, political scientists, historians, lawyers, and philosophers, should be involved more.

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ACKNOWLEDGEMENTS

Many people contributed their time and ideas to this study. Among those making a special contribution are:

William. A. Cook, the EPA Project Officer, who made valuable editorial suggestions.

Marian Dillon, an attorney, who assisted in the legal research.

David Miller, of the Maryland Environmental Trust, who patiently administered the Project.

Lu Ann Young, who typed, proofread, and made editorial suggestions on the final manuscript.

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SECTION I

INTRODUCTION

In 1607, the first English colonists in the Chesapeake Bay region drew their drinking water from the often-brackish James River estuary, which ebbed and flowed past the shores of the swampy island that was to be called Jamestown. In doing so, they exposed themselves to disease-carrying bacteria from their own wastes (according to a theory of a twentieth century historian) and subjected themselves to gradual salt poisoning from the brackish water.[1] Those who sickened and died may have been the first recorded victims of water pollution in the Bay.

Three hundred and sixty-five years later, in 1972, tropical storm Agnes swept through the region, dumping record-breaking quantities of rain throughout the 65,000 square mile basin that drains into the Bay. The resulting floods stripped wastes from throughout the region and dumped them into the Bay, leaving it a vast mess-roil, awash with bacteria, loaded with massive quantities of organic matter, clogged with debris ranging from plastic bottles to houses, and freshened past the level of tolerance of saltwater-demanding plants and animals. In every sense of the word, the Bay was grossly polluted. It had become foul, noxious, dirty, and corrupted, the worst condition in its recorded history.[2]

These two conditions, that of 1607, subtle and speculative, and the one in 1972, blatant and documented, serve as an appropriate beginning and end for this study, a historical survey of water quality issues on Chesapeake Bay. They bracket the period of this study -- from 1607 and European settlement to 1972 and modern megapolis. They reflect the range of issues from the microscopic and localized, to the obvious and Bay-wide. They illustrate that water quality, although affected by human activity, is to a large degree independent of that activity. And they reflect that conditions of water quality may require sophisticated tools of science to detect what may be obvious to the untrained observer.

Between these two events, the people of the region have taken a great interest in the Chesapeake Bay. This report traces the development and evolution of their governments' attention. The focus is on human institutions, ideas, and attitudes, rather than on the physical, chemical, and biological attributes. This report examines: how the ideas about water quality have been

formed, changed, and communicated; how government has organized itself to the task of studying and influencing the quality of the Bay; and how perceptions of the Bay have brought about change in the way it is used.

Our thesis comes from the view that, while it is important to describe the conditions of the Bay as accurately as human science and technology allow, it is just as important to understand how the concept of water quality has operated in the political process. This report, then, is a modest attempt to broaden the debate about the Bay and its future, to include an understanding about how we and our predecessors have shaped and used our governments to have an influence on the quality of Bay water.

Now for definition of terms: government is broadly interpreted to include any activity or viewpoint sanctioned by government bodies. It includes actions by courts, legislatures and administrative agencies -- local, state, and national. During the 400 year recorded history of the Bay there have been shifts in the locus of governmental power. In the 17th and 18th centuries, the courts were the dominant law-making bodies. By resolving a number of ad hoc conflicts, they created what came to be viewed as a body of common law. Then, during the 19th century, the Maryland and Virginia legislatures attempted to address some problems of water quality. They enacted laws designed to resolve specific conflicts over fisheries and navigation. Early in the 20th century there is talk of managing water quality by administrative agencies. Management may be a misnomer. Agencies do not manage the Bay in any generally accepted sense of the word. Although human influence on the Bay has been considerable (both intentional and unintentional), the Bay is still to a large extent beyond the ability of our technology to regulate or control. Nonetheless, an "administrative state" has evolved in which public administrators influence the Bay to a greater extent than courts or legislatures.

Our definition of the Chesapeake Bay is expansive. In a physical sense it is to include the whole estuary -- the semi-enclosed coastal body of water that has a free connection with the open sea and within which sea water is measurably diluted by fresh water derived from land drainage. So defined, the Bay includes long stretches of the Potomac, Rappahannock, York, and James, as well as hundreds of other rivers, creeks, bays, and sounds. The nomenclature of the Bay region is confusing. Some rivers are not fresh and flowing but subestuaries (e.g., Severn River); other rivers flow to the fall line and then become estuarine (e.g., Potomac River). Likewise, some "creeks" are tidal and others not. The words "bay" and "sound" are also loosely applied. Pocomoke Sound fits the conventional definition of a "bay" while Chincoteague Bay (on the ocean) is perhaps more appropriately a "sound." This study avoids semantic confusion

by looking to the estuary regardless of the popular name.[3]

This study also looks beyond the estuary. Because the quality of the Bay is the result of all physical inputs, we consider activities in the entire Chesapeake Bay watershed, which includes six states and reaches as far from the Bay as mid-New York State.

A historical perspective does give meaning to the concept of water quality in Chesapeake Bay. For roughly the first two hundred years covered by this report, the only water quality issues were siltation, the condition of the fishery, and public health. By the 1820s, concerns were growing about the declining stocks of shad and herring. These declines were attributed in part to the effects of siltation, sedimentation, temperature changes due to land clearing, and the mechanical action of ships' wakes, as well as the blockage of streams by dams and raceways.

By the middle of the 19th century, people also recognized that fish avoided areas that were fouled by wastes, such as sawdust, canning wastes, and discharges from slaughterhouses and tanneries. The present usage of the word "pollution" then came into being. Toward the end of the century, fisheries scientists were making the first formal studies of the relation of fish life cycles and productivity to environmental factors, both natural and man-caused. By the 20th century, the germ theory of diseases had added the concept of waterborne disease bacteria to the growing science of water quality of the Bay.

Once it was established that oysters were carriers of diseases originating from human sewage, oyster sanitation then became the most influential water quality concern. This connection was made in the 1890's, but had its first impact on the Bay shortly after 1900. Also about this time, fishermen began complaining about the effects of wastes from food processing plants. Thus began the concern for industrial wastes which, for the first half of the century, continued to come primarily from food-processing industries and other small producers of organic wastes.

By the end of World War I, oil from ships using the Bay was seen by fisheries officials and bathing beach operators as the major water quality problem, and in the mid-1920's, oyster sanitation again became a major concern when several epidemics blamed on bad oysters brought a wide-scale closure of bars. Growth of municipal sewerage and industry, by the end of World War II, created conditions that made pollution in both tidal and non-tidal streams a major concern.

In the 1950's, scientists began to investigate more subtle water quality factors, such as the effects of insecticide, fertilizers, and heavy metals on marine organisms. This investigation

ushered in the era of concern for exotic discharges to the system, which remains a predominant concern today. By about 1960, a new set of concerns was added to the list, including thermal discharges, over-enrichment, general land run-off, and freshwater diversions. Also in the 1960's, the concerns expanded from those of specific conditions and pollutants, to a general worry about the overall ecological health of the Bay -- the concept of water quality shifted from pollution to ecology.

This study takes a historical look at the quality of Chesapeake Bay waters and the measures which governments have taken to influence that quality. Because most conflicts involve the issue of water quality, this study in some respects is a history of Bay uses in general. The organizing principle and point of view, however, is the relation of various uses to water quality, and the way in which government has intervened to have some effect on that quality.

It proceeds in three steps. First comes a restatement of the geographical, physical, and biological nature of the Bay system. Then comes the history itself. The study period is divided into eras: Colonial times to the turn of the Century; 1900 to World War II; World War II to 1960; 1960 to 1972. Within each era the social, economic, and political scene is set, water quality issues are restated, and the responses of governments reviewed. Following the chronology comes summary and conclusions.

Section I Notes

1. Carville V. Earle, "Environment, Disease and Mortality in Early Virginia," The Chesapeake in the Seventeenth Century, Thad W. Tate and David Ammorman, eds., Chapel Hill: University of North Carolina Press, 1979, p. 96.

2. Chesapeake Research Consortium, The Effects of Tropical Storm Agnes on the Chesapeake Bay System, Baltimore: The Johns Hopkins University Press, 1976.

3. In 1964, the Maryland Attorney General ruled that a statute when referring to "rivers, creeks or branches" did not apply to bays; this opinion was subsequently overruled by the Maryland Court of Appeals. Board of Public Works v. Larmar Corp., Vol. 262 Maryland Reports, p. 24, Vol. 277 Atlantic Reporter 2d, p. 427 (1971).

SECTION II

THE NATURE OF THE BAY

A. Describing the Bay

Virtually all written documents about Chesapeake Bay, whether technical or popular, begin with a description of the Bay and the region. Because these descriptions contribute to the composite public perception of the Bay, we would like to make some general observations about these Bay descriptions before presenting our own.

In general, descriptions of the Bay show the lack of a single authoritative source of information about the Bay, its resources, and the region that surrounds it. Those descriptions which do exist are sometimes inaccurate and present problems of definition and interpretation. It is beyond the scope of this report to describe or analyze these descriptive difficulties in detail, but several examples will illustrate these problems and show how they relate to the development of perceptions discussed in this study.

One might expect that physical dimensions of the Bay, which are for the most part constant and accessible to measurement, would be readily available and accurate. Such is not the case. Anyone examining the literature of the Bay, whether recent or old, technical or popular, will find wide discrepancies in the various dimensions. Length, for example, is one such dimension. While one would expect to find some variation because there is some judgment involved in such matters as placing the starting and ending points (e.g., where does the Bay begin and the ocean end, for the mouth; and the Bay begin and the Susquehanna end, for the head), and how to deal with the curves of the Bay, nonetheless these considerations do not account for the wide variation.

In fact, the Bay length has been authoritatively reported to be approximately 190 miles long,[1] using a method of measurement described in the report. We came very close to duplicating this figure using a 1:200,000 scale chart and a map wheel. Yet, in the Corps of Engineers massive Chesapeake Bay study, the Bay is reported to be over 200 miles long,[2] and in 1979, two widely published Bay authorities coauthored a paper in which the Bay is listed as 168 miles (271 kilometers), which is even less than the

straight-line distance between the lines of latitude of the mouth and head of the Bay (37 degrees north to 39 degrees 32 minutes, or 152 nautical miles = 175 statute miles).[3]

Hence, while there are sources of accurate information, it is difficult for all but the most diligent reader to sort out the good from the bad. Because many writers of descriptions draw on previously published ones without question of citation, old errors are perpetuated.

Problems of definition complicate efforts to relate census data to the Bay. Descriptions which give population figures, and at least imply that there is a direct relation between population and the stresses or pressures put on the Bay, pose two questions. First, there is always a question of how to define the Bay region. It might range from a narrow strip of land around the Bay to the entire watershed. Second, and more perplexing, is the question of the relation of human population to the Bay. Impact on the Bay is going to differ, depending on location, method of sewage disposal, predominant land use, and employment. It might be that 5000 watchmakers living in metropolitan apartments would have less impact on the Bay than one dairy farmer living on the shores of an oyster-producing creek. Hence, population figures may lack the analysis necessary to make them relevant to Bay issues.

Perhaps no numbers have more significance to Bay water quality issues than fisheries statistics. Much of the political energy that drives the Bay system is generated over public concern for the state of the fishery. The problems associated with the collection of these numbers are legion. They include: methods of collecting information has changed markedly over the years; methods vary between the states; sport catches are unknown; harvests are affected by economic and cultural forces (low prices and war, for example) having nothing to do with the size of the fish population; fishermen have been suspected of under-reporting catch to avoid taxes and over-reporting to inflate the importance of the fishery. Moreover, fluctuations in fish populations, and therefore catch, are subject to wide variations due to unknown or poorly understood factors. These factors could be natural or of human origin.

Serious study has gone into the examination and analysis of fisheries statistics, and there is continuing advance in their utility as management tools.[4] But over the historical period covered by this report, they have tended to be used uncritically, particularly when inferences are drawn from them about the effect of man's activities on the water quality of the Bay.

B. Characteristics of the Bay

Forewarned by our own criticism, we now undertake our

description of Chesapeake Bay. It is intended to be relevant to the specific topic of study contained in this report -- man's effect on water quality over time.

Geographic Characteristics

It is a common practice to compare Chesapeake Bay to other large estuaries or lakes. In doing so, one of its striking features is that it has a very long shoreline in relation to its overall length or size. Taking the previously discussed length figure of 190 miles and a currently prevalent figure for shoreline of about 8,000 miles, the Bay has a shoreline to length ratio of over 40 to one. Lake Ontario, the smallest of the Great Lakes, has a ratio of about 2.5 to one. For Chesapeake Bay, there are roughly two miles of shoreline for every square mile of surface area; for Ontario, there are about 18 square miles for each mile of shoreline.

These ratios point to at least three important aspects of the Bay. First, they are another way of expressing the extreme "branchiness" of the Bay, which means that the Bay is divided into a large number of separate components, the seemingly numberless bays, creeks, and guts that so frustrated colonial land travellers, but so fascinate the contemporary "gunkholer." Second, the extensive shoreline allows for a high level of human access to the Bay, both to use and enjoy it, and to affect it by his landward activities. Third, the land-water edge is an area of relatively high biological activity, and probably contributes materially to the productivity and biological variety of the Bay.

Another striking characteristic is its shallowness. This is apparent to the visitor of the Bay hydrologic model in Mattapeake, Maryland. There, at a horizontal scale of 1,000 to 1, is a concrete Bay in miniature. The Bay itself is over 1,500 feet long. Since it is enclosed under a single roof, there is a sense of vastness about the place. Yet, the deepest part of the Bay is only 18" deep, and most of the area under water is 3" or less deep. It must then be remembered that the vertical scale is only 1 to 100. Thus, if the model were at the same scale in both directions, the deepest part would be about two inches, and most of the "Bay" would be covered in a film of water scarcely worthy of being called wet. Again, a comparison to Lake Ontario is in order. There, a similar scale model would have a depth of 8 feet at its deepest, and a large area over 5 feet. It would make a fine swimming pool, whereas the Bay model isn't even deep enough for a toddler to wade in. The Bay proper, with its 18 trillion gallons of water, is a veritable drop in the oceanic bucket. Lake Ontario contains approximately 40 times as much water. If dilution is the solution for pollution, Chesapeake Bay has a relatively limited capacity for diluting pollutants.

Finally, it is popular to speak of the Bay as a single system. Yet, in a profoundly important way, it is divisible into many separate subsystems (in a way that many other large bodies of water are not). The rate at which water is exchanged or flushed from a sub-estuary to the estuary is often small or negligible. One effect of this geographic feature has been to make local conditions more acute than they might otherwise have been at the point of discharge. For example, a sewage treatment plant in Baltimore, Maryland has fundamentally altered the quality of Back River. On the other hand, effects from these wastes are more isolated and contained than they would have been if discharged into the main stem of the Bay.

Demographic Characteristics

We have already spoken of the difficulty of relating raw population figures in any direct way to the condition of the Bay. However, several potentially important generalizations are possible. First, municipal-industrial influences, whatever they might be, are concentrated in a relatively small area in and around the cities of Baltimore, Washington, Richmond, and the municipal complex of Hampton Roads, which includes Norfolk among a number of communities. The remainder of the Bay region is relatively lightly populated. Second, these areas have all experienced rapid growth since World War II, and will probably continue to do so. Land use changes within the standard metropolitan statistical areas are substantially from forested and agricultural to residential-commercial, with attendant effects on stream runoff and waste loads.

Third, the region as a whole has substantially less heavy-industry than comparable regions in the East or Mid-west.[5] Employment in government and service sectors, including military, is higher than the regional average. Fourth, even though the region has the image of being an important seafood producer, and fishing provides an important source of employment in some of the smaller tidewater counties of both states, from a regional standpoint the contribution of the fisheries industry to the economy is insignificant.[6]

Physical-Chemical Characteristics

The major physical and chemical features of the Bay have been succinctly and clearly stated by Dr. Donald Pritchard.[7] Several important aspects might be usefully highlighted for the layman. First, waters in the Bay and its principal tributaries are in constant motion, gravity acting differentially on the denser salt water being overridden by the lighter fresh water entering from the rivers. This two layer wedge effect accounts for the presence of sea water (much diluted) near the heads of the Bay and its tributaries, and the eventual exit of river water to the sea. This basic circulation is much affected by

variations in river flow, and combinations of winds and atmospheric pressure changes that can drive very large quantities of water into or out of the Bay. Second, the circulation of many of the smaller arms of the Bay is relatively sluggish, because they do not have a substantial freshwater inflow to establish their own flow system. Their circulation is much affected by the differences in salinities between their lower reaches and that of the Bay. At certain times of the year they can undergo a rapid flushing, because of strong differences between their salinity and that of the Bay. At other times there may be very little exchange. In some respects, then, for substantial periods of the year, these smaller bodies of water are essentially separate from the Bay. This applies as well to the smaller branches of the principal tributaries.

Third, the fate of a constituent added to the waters of the Bay is often a complex one. Silt from land erosion may interact with bacteria from a farm feedlot; nutrients from a sewage treatment plant might combine chemically with the wastes from an industry. A toxic chemical might be buried harmlessly in bottom sediments, or it might be physically and biologically transported throughout the Bay.

Fourth, alterations can have a considerable impact on the physical and chemical oceanography of the Bay. A system of dams might substantially alter the flow regimen of a river entering the Bay. A navigation channel might affect the exchange rate between a tributary and the main Bay. Industrial and municipal wastes can greatly increase the concentrations of naturally occurring substances, or add new and potentially harmful ones. On the other hand, the natural forces affecting the Bay, and their range of variation, are enormous when compared in general to the scale of effects that are influenced or controlled by man. It is important to keep these in perspective when reviewing the history of man's concern for his impact on the quality of the Bay.

Biological Characteristics

A fitting companion to Dr. Pritchard's paper just cited, and bound next to it, is Dr. L. Eugene Cronin's description of the biology of the Bay.[8] Several attributes deserve prominence in this study. First, as the Bay is physically and chemically a highly variable environment, so are the biological populations that fill the various Bay niches. Populations and reproductive success of numerous important species, including the oyster, the crab, and the striped bass, are subject to natural cycles that are as yet only partly understood. Understanding of these natural variations is confounded by the problem of assessing the influence of man, either through his harvests or through his indirect effects on water quality.

Second, the animals of the Bay combine permanent residents, regular and Bay-dependent visitors, occasional visitors, sometimes in great abundance, and strays. The biological openness of the system is one of its prominent features.

Third, the biology of the Bay combines toughness and resiliency to change on the one hand, and fragility and vulnerability on the other, the former because the residents of the Bay are adapted to the great natural variability, and the latter because of the relatively short food chains in the Bay.

This non-numerical description of the characteristics of the Bay has stressed openness, variability, and complexity. We feel that they are the appropriate concepts to present as a prelude to the substance of our historical study. The Bay is also open in a political and economic sense. Man's use of the Bay is very much affected by events taking place outside the region. The recent buildup of demand for coal shipping facilities, a result of the world energy market, is a case in point. The variability of the Bay's quality produces popular misunderstandings. A large fish kill (or more appropriately a fish die-off), is not untypically taken as prima facie evidence of pollution. To argue without other evidence that there is a direct causal link, however, is to commit the fallacy of post hoc ergo propter hoc (after this therefore because of this). This line of argument, regardless of what some ancient Greek logicians might think of it, has been often employed on the Chesapeake. And recognition of its complexity has raised the public consciousness that the Bay is a single ecological unit and has prompted the rallying cry "Save the Bay."

Section II Notes

1. Cronin, W. B., Volumetric, Areal and Tidal Statistics of the Chesapeake Bay Estuary and its Tributaries. Chesapeake Bay Institute, The Johns Hopkins University. Special Report 20, 1971. Despite the definitive nature of this report, numerous Bay authors have continued to use other sources for Bay dimensions, thereby perpetuating old errors.

2. Corps of Engineers, Baltimore District, Existing Conditions Report, Appendix C, Processes and Resources, C-VI-2. This report is the result of multiple authorship spanning years of collection and compilation, actually contains several competing figures for various measurements for the Bay.

3. A. J. Lippson and R. L. Lippson, The Condition of Chesapeake Bay and Assessment of its Present State and its Future. Presented to the Marine Environmental Quality Committee. International Council for the Exploration of the Sea, Warsaw, Poland. Mimeo. 1979, p. 1.

4. A particularly interesting discussion and analysis is contained in A. Y. Kuo, et al., Chesapeake Bay: A Study of Present and Future Water Quality and its Ecological Effects. Gloucester Pt., Virginia Institute of Marine Science, 1975, pp. 1 ff.

5. Baltimore District, Corps of Engineers, Chesapeake Bay Future Conditions Report - Summary, p. 19.

6. Ibid., p. 23.

7. Proceedings of the Governor's Conference on Chesapeake Bay, Donald W. Pritchard, "Chemical and Physical Oceanography of the Bay, II, 49 ff., Annapolis, 1968.

8. Ibid., L. Eugene Cronin, "The Biology of the Chesapeake Bay," 77 ff.

SECTION III

THE FIRST THREE HUNDRED YEARS

A. Background

The first European record of the Chesapeake described it as great and beautiful.[1] The year was 1572, and the writer was a Spanish priest, Brother Carrera. Of this bay he noted that "It is called the Bay of the Mother of God, and in it there are many deepwater ports, each better than the next." The gleam of commerce in Carrera's eye produced fateful consequences.[2]

Newcomers to the New World arrogantly claimed it by "right of discovery." In their minds bloomed the image of wealth, of riches greater than Spain's in Latin America. The chief exploiter of this dream, Sir Walter Raleigh, hired Richard Hakluyt to write Discourse on Western Planning in order to convince Queen Elizabeth and her counsellors to support settlements on a large scale and with a lot of royal backing. This work pointed out advantages to the prosperity of the country: "By makinge of shippes and by preparinge of thinges for the same, by makinge of cables and cordage, by plantinge of vines and olive trees, and by makinge of wyne and oyle, by husbandrie, and by thousandes set on worke."

This visionary book imagined the creation of towns "upon the mouthes of the greate navigable rivers."[3] And Raleigh then proposed his second settlement in the New World to be established on Chesapeake Bay. On January 7, 1587 it was incorporated by the Governor and the Assistants of the City of Raleigh, Virginia. Raleigh's propaganda and overtures inspired enthusiasm in others, although his own plans came to naught.

The next move towards the Bay seemed better planned. The Council for Virginia of the London Company spelled out the moves for the new colonists. Among the instructions, one provided that colonists must not "plant in a low or moist place because it will prove unhealthful."[4] This advice, unfortunately, the colonists disobeyed when they chose Jamestown as a site.

Much has been written about the unhappy years after that choice by the hundred settlers in the spring of 1607. One historian has conjectured that the colonists poisoned themselves with salt from the brackish waters and infected themselves with

pathogens from their own wastes.[5] This detective work in public health may or may not be accurate, but it is certainly the case that by October of 1608 over one-half of the two hundred-odd newcomers had died.

After the first winter at Jamestown, Captain John Smith led a few men in a shallop on a voyage around Chesapeake Bay. The Bay proved to be a monster. Its winds, rains, mosquitoes, and Indians tested the man famous for bravery, boastfulness, and energy. He mapped the Eastern Shore as best he could. But the complex interweaving of water and land defied him, observant though he was. Smith Island recalls his visit in its name. On the western shore he ascended the Potomac a shortways and recorded on his map what Indians reported of its course beyond his range. He discovered the Patuxent River and the cliffs of Calvert, which he called "Richard's Clifts." On the way north he missed West, Rhode, South, Severn, and Magothy Rivers, but found the Patapsco. Evidently he penetrated the Inner Harbor of modern Baltimore and noted the hill we call Federal Hill: "For the red clay resembling bole Armoniac, we called it [the river] Bolus."[6] At the head of the Chesapeake Bay he was disappointed that he failed there to reach the Indies. The year before he had read instructions from the London Company about choosing a navigable waterway running well into the country, preferably in a northwesterly direction, "for that way you shall soonest find the other sea [that is, the Pacific Ocean]."[7]

Three years later (1611) the London Company and its settlers received a gift richer than the gold of the Indies that Smith sought. It came with an immigrant, John Rolfe, was imported from the West Indies, and was a plant, tobacco. This plant flourished in the leafmold-rich soil of Virginia. Within a decade everyone there was planting and harvesting it.

Back in 1586 Sir Walter Raleigh had received a tobacco pipe by way of Spain. Shortly afterwards doctors latched onto tobacco as herba panacea. Other people called it herba santa or "divine tobacco." The upperclasses of the Old World took it up. And Virginia could -- and did -- feed the habit. With the news of how much money could be made growing tobacco, the colony attracted hordes of English, most of them unfit to live on a frontier.[8] Still they came, and by 1640 all the best land on the James River up to the Falls (the site of Richmond) had been taken up.[9]

Virginians, however, soon had competition. Although their Company had received three successive charters from the English Crown, their boundaries in Virginia must have seemed amorphous to the King. The terms of the three documents pushed the boundaries out to include parts of North Carolina, all of Maryland, and parts of Pennsylvania. Then, on June 20, 1632, King Charles I granted to Lord Baltimore the tract of land that Baltimore

called Maryland. Who could question his absolute right to give away the same Bay twice?

Here then came a second colony, and one whose settlers, first arriving on its shore in 1634, sought gold too. They came to an inlet from the Potomac River, St. Mary's River, and called the settlement St. Mary's City. That name seems ironical to us because of its expectation of urban distinction in the tidewater where no real city spread until 175 years later.[10] St. Mary's City proved to have a better site than Jamestown's, for it stood above its river and was well supplied with fresh water.

Colonial rules encouraged the founding of port towns. And they chartered many all around the Bay. They and their merchants clearly hoped for new versions of London and Bristol.[11] Their planning concentrated on towns as conduits for the money that was to flow into public and private coffers. What they got instead were headaches. The first Bay settlement, Jamestown, according to ample evidence, "seemed perpetually on the verge of disintegration."[12]

Although public policy encouraged urban development, no town had developed by 1662 in the Virginia colony, a place that then had about 40,000 population.[13] The reason for this failure lay in the economy of tobacco-growing on far-flung fields of plantation owners that shipped from riverside docks nearby. No planter required a town.[14] But English colonial officials, according to a modern scholar of the tidewater town, "hoped to see Maryland as well as Virginia grow into the kind of colony typified by New England with a town-based culture."[15] He added that London never faced up to the geographic and agricultural realities of the Chesapeake region.[16]

Chesapeake residents did not need cities then. What they did need was land, lots of tobacco-growing land. And they needed waterways to carry the pungent-smelling cargoes abroad. They found both land and water aplenty. Father White, accompanying the first Marylanders, called the Potomac River "the greatest and the sweetest I have ever seen. The Thames is but a little finger to it."[17] There the settlers made a good beginning. They avoided the strange fluxes and agues that had afflicted the Virginians earlier.[18] And they enjoyed the abundant game and fish. They learned from the Indians to grow maize and sweet potatoes. Because the Act of Religious Toleration admitted Quakers, some of that industrious sect had settled around the Bay by 1650, particularly to what is now Anne Arundel County. In 1649, a group of Puritan exiles from Virginia founded Annapolis (at first called Providence), and that settlement became a port of entry. Thirty-five years later it was made the seat of royal government, the proprietorship of the Calverts having been replaced.

But Annapolis did not become much of a town, of course, although as a colonial capital in the 18th century it had its pretensions like Williamsburg, second Virginia capital. We have but to look at population figures. Writing in 1782, Thomas Jefferson reported that Williamsburg never exceeded a population of 1800. Annapolis had about the same. Richmond, Virginia's third capital, unincorporated until 1805, had only 8,000 in 1820, but by that date Baltimore had zoomed ahead of all tidewater towns (for reasons that we will explore) to 62,000.[19]

The reason for the small size of the towns rests on tobacco.[20] Back in 1640 half of the English settlers lived in the Massachusetts Bay Colony. Of the other 15,000, about 8,000 lived in Virginia, and 1,500 in Maryland. Twenty years later 26,000 whites and 950 blacks lived in Virginia, and 7,600 whites and 75 slaves lived in Maryland. During the next fifty years the number of slaves increased astronomically, all hands needed to grow tobacco.

In 1724, an Englishman, the Reverend Hugh James, published, in his Present State of Virginia, an observation that includes the State of Maryland as well:

> No country is better watered, for the conveniency of which most houses are built near some landing-place; so that any thing may be delivered to a gentleman there from London, Bristol, etc. with less trouble and cost, than to one living five miles in the country in England; for you pay no freight for goods from London, and but little from Bristol; only the party to whom the goods belong, is in gratitude engaged to freight tobacco upon the ship consigned to her owners in England. . . . . Thus neither the interest nor inclinations of the Virginians induce them to cohabit in towns; so that they are not forward in contributing their assistance towards the making of particular places, every plantation affording the owner the provision of a little market.[21]

That little market resembled a "company town,"[22] with the head of the company, the planter, then fulfilling many roles -- farmer, judge, merchant, doctor, host, and -- always -- aristocratic lord of the manor in the English mold.[23] We do well to look at him closely. On him centers economic, social, and political history in the tidewater. In him we find influences on the governing of the uses of the Bay. He served as legislator, he acted as sheriff, he decided as judge.

Economically speaking, the planter and his tobacco crops dominated the Bay region. With 5000 acres and the work of

slaves, he could afford to live like a lord. (Even fifty acres of tobacco land supported a family in the 18th century.)[24] With money to live like a lord, the planter did ape the social life of the English gentleman of status and large estate. And like that gentleman he could tail his estate to insure keeping the land in the hands of the few. On his land he built and maintained a Great House. With plenty of credit in London, he bought luxuries to adorn it. He also bought culture. Though the level must have been superficial at first, the culture of the tidewater deepened by 1750 to shine in what has been called the Golden Age of the Bay aristocracy.[25]

That Golden Age shaped major founding fathers in the creating of the United States: Washington, Jefferson, Madison, and Monroe. These men were planters and heirs of the tradition of the planters in politics. Writing in his classic study The Americans: The Colonial Experience, Daniel J. Boostin suggests why modern American democracy may chiefly descend from the Virginia tobacco aristocracy?

> Traditionalism -- their loyalty to the working way of ancient England -- rooted them in time; localism -- their loyalty to the habits of their parish and county and to their friends and neighbors -- rooted them in space. The strength of both these sentiments . . . accounts for much of what they made of Virginia, and of what Virginia in the critical early years of the Republic gave to America.[26] The strength of their traditionalism was before long to be expressed in the American Revolution in defense of the rights of Englishmen. The strength of their localism was expressed in the autonomy of the parish and in the federal spirit in the Constitution and in the devotion of States rights. The fact that their tradition was loosely stated -- their model was the life of the English country gentlemen -- made their tie to tradition no less real.[27]

Boostin asserts that even when commerce went to town, leadership stayed in the country. But in the 19th century towns did grow, and the story of the growth of Baltimore, the largest of them, will illustrate how and why.

Baltimore first made a reputation as a brash town on the Chesapeake Bay. Other tobacco ports, of course, existed before the chartering of Baltimore in 1729. This new town spread across land owned by the great Carroll family and in time surrounded the plantation house of Charles Carroll the Barrister, Mount Clare. That mansion, which still stands today, received guests like Washington and Lafayette in the 18th century.

Those early guests stopped as others less lordly did because Baltimore grew up at a crossroad. It happened to be on the main land route south from Philadelphia. And, like Richmond, Virginia, it stands on the fall line of its river. Quite early David Johns built a mill on Jones Falls, then a brawling stream that debouched into the Inner Harbor. He was joined by English Quakers named Fell, one of them a ship-builder, who bought land on deep water (now Fells Point) and inaugurated an industry and a port. Named for an Irish port, Baltimore received immigrants happily. One of them from the north of Ireland, Dr. John Stevenson, came up with the idea of shipping the good Maryland flour abroad.[28] Trade burgeoned.

Still, Baltimore was a city-come-lately among east coast ports. It had only 5,000 population in 1770 when Philadelphia ranked as the second largest town in the British empire. No wonder Congress complained about Baltimore when, in 1776, it took refuge on Baltimore Street from the capture of Philadelphia by British troops. The little town's shipyards, nevertheless, produced sturdy warships for Congress.

After the Revolution the fast schooners of Baltimore carried its name around the world -- the Baltimore clipper -- and brought wealth and crowds of immigrants. The town's privateers created the "Nest of Pirates" that the British feared and sought to destroy in the Battle of Baltimore, a climax in the War of 1812. The citizenry rose as one to rebuff the attack in September 1814. They also sang about the victory in the song written by one of them, "The Star-Spangled Banner," and they named streets after its heroes. To this day, Baltimore remains the only major American port never occupied by a foreign power.

Clearly the town had guts as well as enterprise. Its citizens created first the clipper ship and then the Baltimore & Ohio Railroad. Both helped make the population double every decade. Chief molders of the city's character appear to have been businessmen, men of the Venetian stamp,[29] as one memorialist called them. Shrewd and aggressive, they ruled the world trade-routes as well as the city. Yet, part of the city's character yielded to the civilizing waves of gentility and genius -- and of women -- that washed over the town between 1800 and 1860. It makes a town special to have held within its bounds the first American saint (Mother Seton) as well as artists of the calibre of Benjamin Henry Latrobe, the architect, and the Peale family of artists and scientists, and Edgar Allan Poe.

A less attractive side of the city's character caused Baltimore to be called Mobtown. At Commerce and Pratt Streets was spilled the first blood in the Civil War, when a mob attacked troops from Massachusetts who were rushing to defend Washington. Baltimore remained divided in sympathy between

north and south, a price paid for its location. Until the end of the war, it felt the despot's heel against its windpipe.

This two and one-half century survey of Maryland and Virginia history reminds us of the significance of the tidewater. Chesapeake Bay held out false promise as a route to the East, but settlers followed the disappointed explorers to create a tobacco aristocracy dispersed along its shores. Later came the port cities, preeminently Baltimore, which served as a point of trans-shipment and eventually became diversified mercantile centers.

Settlers and their successors exploited the waters of the Bay region. For them the quality of the water was not a problem but a solution. Besides shipping, waters were used for drinking, as a sink to dispose of wastes, and as a fishing ground. The problems arose when these uses came into conflict.

B. Water Supply

The settlers first demanded pure water to drink. Not all the imported beer and sack could substitute. Planters and townsmen alike had trouble finding and retaining sources of good water. As with so much else, we can begin with Captain John Smith. On the Eastern Shore at one point in their explorations of the Bay they found only a puddle from which to fill "but three barricoes . . . . We digged and searched in many places, but before two daies were expired, we would have refused two barricoes of gold for one of that puddle water of Wighcocomoco."[30]

When springs were lacking, the inhabitants dug wells. They also dug latrines and, later, cesspools. The hilliness of Richmond and Baltimore permitted good drainage of storm water and of domestic and industrial wastes up to a point.[31] Also, for years Baltimore's lusty streams rushing through the hills provided both drinking water and a channel for wastes to enter tidewater. This mixture of uses inevitably led to trouble.

It led, moreover, to attempts not only to provide a supply, but also to protect the drinking water in towns. In 1792, for example, the Insurance Fire Co. of Baltimore was authorized to sell shares to obtain capital for supplying the town with a reservoir and with pipes to conduct the water.[32] Again, in 1800, the legislature gave that town permission to construct a water supply system. We must keep in mind that Baltimore's population was just about doubling every decade after the American Revolution. By 1809 the town's natural springs were being encroaches upon by the growth -- "threatened with destruction by other improvements"[33] was the exact statement. Central Springs on North Calvert Street (the present site of Mercy Hospital) was incorporated, and soon two others, Cloppe's in the south of town and Sterret's in the east, were

incorporated.

Like the water company in New York City (from which evolved Chase Manhattan Bank), Baltimore's became more intent on other money-making ventures than on providing streams of clean water. In 1830 the Baltimore Gazette and Daily Advertiser carried a report of the Water Committee asserting that that company provided only for the central section of town. Besides, more than half the year its color and "consistency" made it unfit for any use. And sometimes there was no water at all.[34]

Norfolk fared even less well. From its earliest days visitors noted that the water was brackish and, some said, unpalatable. A public spring was located near Main and Church Streets, but the river itself provided "the place appointed for the public laying" (appointed by the Norfolk Council). So bad was the taste of the drinking water from pollution and brackishness that in the summer of 1800 a man who owned a good well on Briggs' Point, Johnny Rourke, peddled water from his "tea wagon." Fifty years later most of the drinking water came from cisterns. And only after the Civil War did the city begin to tap Lake Drummond and Deep Creek.[35]

Authorities took steps to prevent contamination of water supplies. The word "pollution" appeared in a provision of an act of the Maryland legislature establishing the Baltimore Water Company in 1808.[36] A fine was imposed on anyone polluting the Jones Falls, the source of drinking water, between the pumping house and the mill.[37] This stream evoked plenty of controversy as a source partly because its supply ranged from trickle to flood. After the mid-nineteenth century other sources had to be tapped for Baltimore, the Gwynns Falls, the Gunpowder River, and eventually, the Susquehanna River.

As late as 1886 the Maryland legislature had to reiterate the prohibition "pollution" of the water supplies.[38] In 1874 it was made illegal to throw dead animals or other substances into the Potomac River.[39] That tributary provided drinking water for many settlements, including the District of Columbia. The report of the Baltimore Water Commission in 1853 argued against building an open canal to the reservoir from the source, because "water is exposed to all the filth and dirt which anyone chooses to throw into it."[40]

A classic case of conflict between using water for drinking and for disposal of wastes was resolved in 1882 when the mayor and city council of Baltimore sued the Warren Manufacturing Co. and Summerfield Baldwin.[41] The defendant's cotton factory, it was complained, dumped "divers injurious ingredients and substances" into the Gunpowder River that had been dammed for reservoirs by Baltimore city. The resulting pollution contaminated the drinking water of Baltimore. The court held that the

privies and hogpens near the factory did indeed pollute and had to be removed. But the city was denied relief against the manufacturer since it was unable to prove the nature of the pollutants emanating from the manufacturing processes of the company.

A sampling of the case law in Virginia during the 19th century reveals that the courts had to deal mostly with mills that seemed to create disputes. But courts decided not only about competing rights, but they also addressed pollution issues.

For example, in 1828, a mill dam across Little Creek in Nottoway Co. caused stagnant waters. The court distinguished public and private nuisances: to be public it must injure a right in which the community has a common interest (i.e., preserving the lives and health of its members). The plaintiff failed to show that the stagnation affected a public highway or some other place in which the public had such special interest.[42]

Again, in 1833, a court dealt with a case of stagnation caused by the construction of a mill and milldam, this one on Deep Creek. The Maud family suffered "severe bilious diseases" every year, and several "intelligent physicians" and others from the territory testified that the diseases were "justly imputable to the effluvia from the stagnant waters of the mill pond."

At the washing away of the mill, a suit was brought to prevent the owner from rebuilding. The latter argued that he had built under statutory authority and had a statutory right to rebuild. The court of equity asserted it had the authority to "prevent the destruction of health and life, and it distinguished between danger to health and danger to fish and navigation. The court ruled that it will allow experiments with the latter, but as to the former "The law tolerates no such experiments at the risk of human life."[43]

Health certainly posed the major issue connected with water quality in the first two hundred and seventy-five years of our history. The chief enemies to good health, contagious diseases, ravaged towns and cities periodically. For centuries people blamed contagion on the air, not the water. The transmitting by mosquitoes of both malaria (or swamp fever) and yellow fever was not discovered until the very end of the 19th century.[44] The bacterial cause of cholera was uncovered in 1884 in Egypt. All three diseases spread frequently around the shores of the Chesapeake. Every August newspapers filled columns with accounts of pestilence and alarm.

The summer epidemic of 1855 in Norfolk illustrates the horrors of yellow fever. A steamer bound from St. Thomas to New York put into Hampton Roads for repairs. On board were cases of

yellow fever, a fact kept hidden until a shipyard laborer contracted the disease. By August the city of Norfolk as well as Portsmouth suffered decimation of population. Reports say that the city was wrapped in gloom. Most people were either confined with sickness or waited on the sick. The number of deaths rose to 100 daily, and the supply of coffins gave out. The calamity shocked residents, particularly since they had begun to believe that their attention to draining streets and using cisterns for drinking water had saved the city from the recurrence of epidemics such as those of 1821 and 1836.[45]

As early as 1801 the Maryland General Assembly had authorized the construction of what was called the "lazaretto" (or quarantine station) on the shores of the Patapsco River at the edge of the Baltimore harbor.[46] This city already had its "health police," agents for the commission of citizens that was set up when Baltimore was incorporated by the state legislature in 1797.

In 1874, Maryland established a state board of health to guard the sanitary interests of the people of the state and to investigate the causes of disease and mortality and to investigate nuisances.[47] Local boards of health were authorized by Maryland's legislators in 1886.[48]

Just how far attitudes had changed we can see by comparing these steps with the comment of a civil engineer, Charles Varle, writing in 1833, only fifty years earlier. After praising what he called the efficiency of the health police of Baltimore, he noted the calamitous ravages of cholera in 1832. Out of a population of 80,900, 3,572 people died. Varle added, "May the great Disposer of events hereafter keep us free from pestilential visitations."[49]

Citizens prodded officials to prevent the spreading of disease associated with water and waterfronts. The fever, it appears, was more terrifying than fire or flood. One gadfly, Dr. Thomas Buckler, published a map in 1851 showing the areas of remittent and intermittent fevers around the Patapsco River.[50] These were extensive. Buckler had his theories of the causes, just as other people did: he blamed uncleanliness generally and decaying refuse and garbage in particular. Darkly he prophesied that "the germs of an epidemic introduced into the polluted atmosphere surrounding this festering pond [the Inner Harbor of Baltimore]" would spread. His solution combined ingenuity with a lucrative angle. It was simple: shave off the hill adjacent to the Basin, Federal Hill, and fill in the Basin for building lots.

Thus, he would have rid the city forever of what he called "the most unwholesome, disease-engendering and pestilential condition of the Basin and Docks." He also would have eliminated

"the stagnant mill-ponds along the Jones Falls, to say nothing of the putrid, seething and malarial condition of the tidal portion of the Falls." In addition, he suggested deepening the falls, so that "the tide may ebb and flow as high up as Madison street bridge" and in its scouring remove the causes of disease.[51]

Back in 1797 another physician, Dr. John Davidge, a leader in Maryland medical circles, declared that yellow fever was not contagious. In Philadelphia, the well-known Dr. Benjamin Rush agreed, but few other people did. People noticed that this disease for a period always started at Fells Point, and usually near Smith's Dock. Some noted that just east of the Point and between it and the lazaretto (quarantine station) stood stagnant ponds. That was true during the epidemic of 1819.[52]

After 1822, statistics show a decline in deaths in Baltimore as yellow fever and malaria diminished. The reason lay in better drainage and in less commerce with the West Indies. An urban geographer, Sherry Olson, recently wrote that in this period a learning process was at work resulting in what she calls the creation of "new institutions of collective response." The series of epidemics, she hypothesizes, called attention to certain "foul and filthy spots and spurred the increase of regulatory power."[53]

People believed that the shorelines of harbors threatened disease. Public opinion, therefore, forced attention of town and county officials to get rid of marshes and low ground around settlements. In 1766 an "Act to Remove a Nuisance in Baltimore Town" denounced in vivid language "large miry marsh giving off noxious vapors and putrid effluvia."[54] Land owners were given four years to wall off this blemish on the waterfront and fill it in.

So sensitive indeed were the noses of the 19th century that writers vied with each other to describe the various perfumes wafting up from the Basin in Baltimore. One called it "hell-broth."[55] It was "a bubbling cesspool" remembered Abel Wolman, a man whose memory reaches back to 1900. He recalls returning at night about 1910 on the boat from Tolchester and knowing when he was within five miles of the city by the odor.[56]

A contemporary historian concludes that Dr. Benjamin Rush of Philadelphia "tried to improve the public health in Philadelphia by such common-sense expedients as sewage disposal, pure water, and clean streets."[57] In other cities similar analyses appeared. Among reports of the Baltimore Public Health Department for 1825 appears a note by a prominent doctor, Thomas E. Bond, who was called "Consulting Physician": the situation on Washington Street, Fells Point, "threatens to produce unfriendly effects on the health of neighboring inhabitants [because] the

fall is insufficient to carry off the water with sufficient celerity . . . ." He added that "below the apron [of the planks at the south end of the street] a very dangerous nuisance" arose because "water . . . becomes stagnant, and emits at this season a very disagreeable smell and will in the hotter season of the year be a fertile source of deleterious exhalation."[58]

C. Waste Disposal

The brackish waters of Chesapeake Bay, while unsuitable for drinking, were an ideal sink for waste disposal. Inhabitants flushed their sewage and refuse into the receiving waters of the estuary. In Norfolk, wrote the traveller Mederic Moreau de St. Mery in 1794, "The sewage ditches are open, and one crosses them on little narrow bridges made of short length of plank nailed to cross pieces."[59] These ditches, of course, emptied into the convenient Bay.

Sixty years later Washington, D.C. appeared "as sour as a medieval plague spot," according to a later historian of the Civil War, Margaret Leech. She called the sanitary conditions of the crowded capital appalling. "With its river flats, its defective sewage system and its many privies, it had always been odorous in war weather," but now in wartime, crowded D.C. epidemics of disease threatened. "The comatose Board of Health aroused itself to a protest, the Surgeon General made inquiries and the War Department conducted an investigation," she cynically concludes.[60] Not until 1889 were sewers constructed by the Board of Engineers.

In Baltimore at that time, the harbor ranked "among the great stenches of the world."[61] That City stood out as the last of the great cities to build a modern system for sewage. It came in 1906-1915. Writing in 1912, Clayton Coleman Hall boasted that completion of the system would make Baltimore "the best sewered and drained city in the world."[62] His enthusiasm carried him into error when he added that "the sewage [after processing] when discharged into Back River will be purer than the water into which it is discharged and will be absolutely innocuous to the oysters and fish inhabiting the waters of the Bay." Such proved not to be the case.

Baltimore in fact makes a useful example because it became the metropolis of the Chesapeake region. By 1850 the city had grown to be the third largest in the United States with 170,000 population. The 70,000 represented the growth during the preceding decade. In the article about Baltimore in the contemporary Gleason's Pictorial Drawing-Room Companion, the writer noted that "The city is built on quite uneven ground, which gives an advantage in relation to cleanliness."[63]

Fifty years later 15,000 houses had private lines to the

Jones Falls for disposing of raw sewage. But more houses had cesspools that were cleaned regularly by Odorless Excavating Apparatus Co.[64] The population then stood at half a million. What had once been of such great service, the good drainage of the hilly terrain and its streams, no longer served. The soil became saturated, floods occurred in downtown, and the Inner Basin smelled to high heaven.[65] Dr. Thomas Buckler proposed, facetiously, that the gases from it be collected to use in Congress. And he worried about the Inner Harbor, not facetiously, that "an epidemic introduced into the polluted atmosphere surrounding this festering pond [will spread]."[66]

In 1875, Milo W. Locke defended his plan for a thorough purification of Baltimore Harbor. He proposed keeping the water in motion and by diluting water into which organic matter is deposited. This defense is in print and has two fold-out drawings showing how this plan would work. His plan was but one of fifteen proposed about 1875 to the Joint Standing Committee on the Harbor, Baltimore City Council.[67]

Another source of pollution came from the draining of the filth from streets and shore. For example, the records of the city of Baltimore, 1782-1797, include a resolution in June 1795 "that Daniel Grant be notified to remove a Nuisance on Public Alley, which is occasioned by his necessary."[68] Other nuisances strewed the alleys -- and the main streets. Even as late as 1900 stepping stones remained in use to aid pedestrians in crossing alleys clean-shod above the open drains.[69]

Streams like Harford Run and Jones Falls in Baltimore became nothing but canals to carry off the town's wastes. An English M.P., Sir. George Campbell, commented in 1879 after a visit that "a peculiarity of Baltimore is that there is no system of underground drainage" and an understatement worthy of quotation added that this arrangement was "not very agreeable to the senses." But he was not certain that this city's old-fashioned way was not "much more wholesome than our [i.e., London's] underground system."[70] Why, he didn't say. Possibly he was thinking of sewer gas.

A century earlier, Baltimore Town Commissioners in February 1768 devised a system of draining water from the main street, Baltimore Street. The record specifically states the importance of directing it to the tidewater. What was decided was to make a small ditch or canal on both sides of the street, the one on the south (or harbor side) to lead to Gay Street and thence down Gay Gay through a canal to the waterside. The north side required a more elaborate route by way of the creek (Jones Falls). Later Ann Street, running downhill to the harbor, was given a concave shape with a one foot rise to create a storm drain.[71]

Agricultural and industrial wastes also were disposed of in streams and tidewater. Plenty of running water made this flushing easy and effective. But even as early as the 17th century, town fathers took care to isolate certain trades from the town center. In laying out Annapolis, for example, Governor Nicholson imposed an elaborate baroque plan placing centers of church and of government on hilltops and creating separate districts, quite distant, for "Brewhouses, Bakehouses, Dyers, Salt, Soap, and Sugar-Boilers, Chandlers, Hatmakers, Slaughter-houses, some sort of Fish-mongers, etc."[72]

Then, in the 19th century when coal mining became a vast industry in the mountains of states bordering the Bay, streams carried off wastes produced by a vast industry. For example, silt and acid from anthracite coal were dumped into the Susquehanna's North Branch in Wyoming Valley, Pennsylvania, and bituminous coal wastes went into the West Branch.[73]

D. The Fishery

For settlers faced with the threat of malnutrition or starvation, the Bay contained godsent foodstuff. Shellfish and finfish were plentiful.[74] John Smith noted that the male Indians "bestowe their times in fishing, hunting, wars, and such manlike exercises."[75] And Smith's contemporary in Virginia, George Percy, wrote of the very large oysters roasted by Indians, so "delicate in taste."[76] Down the years seafood made welcome gifts.[77]

The colonial governments in both Maryland and Virginia were granted by the Crown the right to dispose of the tidewater subject to public rights of fishing.[78] And exercise their right of fishery, the public did.[79] Even in the first century of colonization some waters were overfished. In 1678 the Middlesex Court in Virginia acted to conserve the country's fish. Certain residents had overfished, in the words of the complaint, "to the Great Hurte and Greivance of most of the Inhabitants of this County."[80] A century later, in 1796, the Maryland Assembly passed an act for the preservation of a breed of fish in the Patuxent River: "there should be no whipping or beating the water between February 1 and June 1."[81]

Following independence the inhabitants of Maryland and Virginia succeeded to all rights previously held by Crown and Parliament. These rights were to be exercised by the General Assembly in Maryland and the legislature in Virginia. The Virginia Constitution restricted this legislative power by prohibiting sale or lease of "natural oyster beds."[82]

Not long after independence, disputes arose between Maryland and Virginia as to fishing rights. The Potomac River served as the major boundary between the states, and Maryland

claimed, by virtue of its Charter, exclusive rights therein. Virginia was taking advantage of its sovereignty over the capes of the Bay to charge tolls for vessels carrying goods to and from Maryland. In the Compact of 1785 Virginia agreed to give vessels bound for Maryland free passage in return for an agreement by Maryland that the right of fishery in the Potomac was to be equally enjoyed by citizens of both states.[83]

In the Potomac then, fishery was governed by "mutual consent and approbation of both states." Elsewhere in the tidewater the states went their respective ways. From the beginning fishermen put pressure on legislatures to protect the supply of fish by keeping waters open for their passage of fish.[84] The courts also ruled against obstructing rivers and streams with mill-dams, weirs, and hedges. Since these regulations of course aided navigation as well, much of the wording was general. But many specifically call the obstruction (usually a mill) deleterious to fish.

Examples of the conflict between fisherman and mill-owners would fill a book. In Virginia, for example, in 1748 the legislature passed an act that authorized clearing rivers where the passage of fish was obstructed,[85] and it went on in 1759 to order owners of mills on the Rapidan to make slopes for the passage of fish, because the inhabitants of Culpeper and Orange Counties had complained. Within the decade other acts forced mill-owners on the Rivanna, Hedgeman, Meherrin Rivers also to make slopes.[86] Building mills on the Rockfish River below the forks was prohibited, and one Allan Howard had to tear down his mill in 1761 because it was entirely obstructing the passage of fish.[87] The Maryland legislature also enacted legislation, usually about a specific tributary: the Patuxent in 1802, the Monacacy in 1806, the Susquehanna in 1813, and the Pokomoke in 1862.[88]

In these official actions, governmental officials responded to, and evolved a way of dealing with, conflicts over different uses of tributary waters.[89] But fish in quantity was the goal at all cost.[90]

Like finfishermen, shellfisherman took all they could -- an enormous volume in the late nineteenth century -- and jealously guarded their territories.[91] They began making a living by oystering, early. And by the end of the eighteenth century they had organized an industry. They borrowed the Indians' log canoe and improved on it for transporting oysters from the rocks, the natural oyster beds. Likewise, they appropriated the Indians' rake, joined two of them with a hinge, and thus invented the oyster-tong that continued in use through the nineteenth century. By 1875, these watermen (as they were called) were harvesting millions of bushels of oysters a year. But the supply did not last.[92]

When necessary, watermen looked to the Courts to protect their rights in God's oysters. At the time of the Civil War in Phipps v. Maryland,[93] the defendant was accused of taking oysters from a private bed. He defended on the grounds that there was a common law right of public fishery. Apparently, however, such rights do not extend across state lines. A decade after the Civil War in McCready v. Virginia,[94] the United States Supreme Court held that the Virginia legislature could lawfully exclude a Maryland resident from taking oysters in Virginia waters. Watermen also looked to the legislatures. The greatest volume of legislation in the 1800's, related to the waters, concerned the fish and oysters, but mostly oysters. The state legislatures, particularly Maryland's, tried to control oystering and to maintain the supply.[95]

The Maryland Assembly in 1834 met the concern of oystermen that improper seines in use were covering oyster beds with mud and thus diminishing the harvest.[96] In 1860, the Assembly set seasons for oystering.[97] It also imposed fines for throwing oyster shells in the water. Already laws existed on the books of Virginia which prohibited the "casting of Ballast into Rivers and Creeks" (1691) and required it to be placed on land above the high water mark.[98] In 1748, the Virginia legislature authorized overseers to direct the delivery of ballast to the shores.[99] No doubt such laws were passed to aid navigation as well as to protect fisheries.

E. Navigation

Many factors contributed to the success of the Bay trade. If the Chesapeake doesn't exactly match the Mediterranean climate, it nevertheless remains open year round. There is little fog. And, as an observer said of Richmond when that city became the capital of Virginia in 1779, it is "more safe and central than any other town on navigable water."[100] Another advantage derives from the rush of freshwater that spilled into tributaries of the Bay from the Piedmont Falls. That freshwater was used to kill what were called the termites of the sea, the shipworm, or teredo, enemy of wooden ships. The waters of the Jones Falls in Baltimore's Inner Harbor cleansed many a sailing ship.[101]

The sprawling tidal estuary permitted ships to sail far inland. This realization occurred to William Byrd II in laying the foundations of both Richmond and Petersburg in the 1730's:

> the uppermost landing of the James and Appomatox rivers, and are naturally intended for marts where the traffic of the outer inhabitants must center. Thus we did not build castles only, but also cities in the air.[102]

Merchants especially worked to promote the navigability of these rivers. They sought the help of both courts and legislatures to keep ships moving smoothly wherever trade beckoned. Various colonial bodies tried to assure removal of floating trees, logs, and limbs; pushing a tree into the water is easier and quicker than sawing it or burning it on land.

From the beginning Virginia lawmakers focused whatever attention they gave to water on its usefulness as a road. The focus was based on economics, not 20th century concerns with pollution or siltation. There are laws on the books that address improvements to navigation on almost ever major river.

In 1679, a Grand Assembly met at St. James City and passed a law authorizing the clearing of rivers near their headwaters of logs and trees. Furthermore, the counties were left to decide when and how to conduct improvements of the rivers to facilitate the passage of ships.[103] Then, in 1860, the legislature authorized appointment of county surveyors to clear waterways. Cited was the loss of boats because logs, trees, etc. were not cleared. A fine of 500 pounds of tobacco was imposed for obstructing navigation.[104]

Again in 1722, the legislature passed an act for the "More Effectual Clearing of Rivers and Creeks." In the preamble to the Act, the legislature declared that "many of the rivers and creeks of this colony are stopped and choked up by the fall of trees, stumps, and rubbish . . . and hedges are made across the same whereby the passage of . . . vessels is hindered and obstructed . . . to the great damage of the inhabitants . . . hinderance of their trade and commerce."[105] The county or counties were then authorized to contract to clear the streams. A later act especially noted that the debris thrown into the water not only obstructed navigation but also caused bridges to break down and get washed away.[106]

Since shipping tobacco dominated trade, certain acts specifically refer to the more convenient transport of tobacco.[107] One hundred pounds, appropriated at the time, was to clear the Fluvanna of rocks.

In Maryland, also, the legislature and courts helped keep channels open. For example, in Harrison v. Sterett, decided in 1774, the Provincial Court of Maryland granted relief to one waterfront lot owner against a neighbor who was constructing a wharf which would have restricted his water access.[108] And, in 1768, the Maryland Assembly passed an Act to Prevent Obstructions in the Patomack and Monocacy Rivers caused by fish dams.[109]

Townspeople insisted that the leaders manage shipping in the harbors. Ports around the Bay revived the ancient post of Port Warden for the purpose. The warden's duties included

conducting surveys of channels and keeping them clear and clean. He was to remove obstructions and annoyances. The Maryland Act Appointing Wardens for Baltimore Town in 1783 (this was before the incorporation of the city) permitted the wardens to pass regulations and ordinances preventing injury to the harbor from wharf construction, discharge of ballast, or any other cause.[110] They were specifically asked to approve all wharves that divert the channel or obstruct navigation.

In the previously discussed Compact of 1785, Maryland and Virginia agreed that their respective citizens could share navigation rights over the Potomac River, and that Virginia would give ships bound for Maryland free access to the Bay. An act of the Maryland Assembly in 1791 authorized commissioners of the City of Washington to enact regulations governing the discharging of ballast from ships in the Potomac above the lower line of the District of Columbia and Georgetown and in the eastern branch.[111]

Ballast-discharging bothered Baltimore, too. But a persistent concern of Baltimore's merchants was the shallowness of the Inner Harbor (formerly called the Inner Basin or Basin, the northwest branch of the Patapsco River), where the wharves were both numerous and long. Wharves were numerous there because the chief merchants ruled from there, and they were long because they had to reach out to the seagoing ships. The shallowness was increased by the deposit of sediment washed down by the Jones Falls into the narrow basin. An act of the Maryland Assembly in 1791 authorized the deepening.[112] And, after the War of 1812, the leading politician in town, General Sam Smith, persuaded the federal government that the ships sunk in the channel as defense against the British attack on the city in September 1814 had to be removed at the federal government's expense. The funds obtained not only raised the ships but also deepened the channel.

Also important to trade was the maintaining of channels to upper estuary ports.[113] Virginia and Maryland legislators were forever opening and extending navigation beyond the settled districts.

In 1817, Maryland authorized the use of lottery revenues to improve navigation,[114] and, in 1814, created the Potomac Company to extend and improve navigation on that river.[115] Earlier it acted to remove bars, shoals, and other obstructions from that river near Bladensbury.[116] But that act did little good because the silting-up continued, and Bladensburg remained (and remains) a backwater isolated by silt.[117]

An unfortunate effect of settlement on the Bay's shores was increased erosion. A modern study of the Bay notes, "The early settlers wrote of soil erosion and the muddiness of freshets.[119]

By 1800 silting had destroyed the channels leading to prominent tobacco ports at Joppatowne, Port Tobacco, and Upper Marlboro in Maryland. On the Gunpowder River, Joppatowne once took an eight foot draft. But just between 1848 and 1897, 7,900,000 cubic yards of sediment was deposited in the upper part of the Gunpowder River estuary. "Careless use resulted in much erosion of the land in the 18th and 19th centuries."[120]

In 1753, the Maryland Assembly passed an Act to Prevent Injuring the Navigation of Baltimore-town and to the Inspection House at Elk Ridge Landing in the Patapsco. The legislators noted that by opening and digging into banks of that river, large quantities of earth and sand are washed into the water. They also made it unlawful to put earth, sand, etc. into navigable branches unless well secured.[121]

And in 1783, that Assembly gave the port wardens power to enact regulations to prevent injury to the harbor from construction land, earth, or soil contiguous to the basin or harbor that might fill it up or obstruct it.[122] A century later the Assembly prohibited disposal of ballast or earth in the Bay itself.[123]

The main problem centered in Baltimore, where citizens worried about silting from at least the 1780's on. Cutting down on Hugh Street at the foot of Federal Hill caused continuous erosion into the Harbor.[124] And, as construction spread northwards along Jones Falls, the mouth of that stream built up alluvium in shoals.

From 1800 on, regular dredging was done in the Potomac at Georgetown, Washington, and Alexandria. By 1863 soil pollution posed a general problem along the Potomac.[125] Today 25 to 30% of the million tons of sediment entering the Potomac come from construction sites in the District of Columbia area. National Airport is built on dredged channel sediment.[126]

The mid-19th century produced a clutch of cases concerning efforts to improve navigation. In Garitee v. Baltimore, the City deposited dredge spoil in front of the plaintiff's property; the court granted the plaintiff relief.[127] In Baltimore & Ohio R.R. v. Chase, a dispute arose between neighbors as to access rights; the Court preferred the rights of the railroad which had already constructed a navigation improvement.[128] In Norfolk v. Cooke, the city was granted relief which precluded a private party from filling in the tidal basin.[129]

In 1890, the national government also became involved in the regulation of navigation. The U. S. Army Corps of Engineers, long active in dredging and the construction of waterway improvements, was directed to establish lines in various harbors beyond which piers or deposits could not legally be placed.[130]

F. Residential and Recreational Use

Tidewater towns have not always been agreeable places to live. Hampton, Virginia, for example, stands as the oldest settlement of English America in continuous existence. But its marshes and mud banks early made it unhealthy. In 1796, Isaac Weld reported that Hampton was "a dirty disagreeable place, always infested by a shocking stench from a muddy shore when the tied [sic] is out."[131]

Again, about Norfolk, Wlliam Byrd II wrote, "With all these conveniences it lies under the two great disadvantages that most of the towns in Holland do by having neither good air nor good water."[132]

But living near the water satisfied an esthetic sense as well. Siting public buildings and dwellings on rises above rivers and the Bay not only gained desirable "better air" but also the view. Looking up at these buildings from the water, as almost all visitors did, people on shipboard enjoyed the way the man-made crowned the wilderness.

George Washington, for example, boasted that "No estate in United America is more pleasantly situated" than his Mount Vernon on its plateau above the wide Potomac.[133] Similarly placed, the 18th century State House and the Governor's Mansion in Annapolis and Jefferson's state capital in Richmond originally overlooked their tidal waters.

Lacking such grand vistas of water, English gentlemen constructed artificial lakes or reflecting ponds and fountain pools like those at Blenheim and Chatsworth. Fortunate Marylanders and Virginians took advantage of their broad rivers and bays to create similar (but larger) picturesque effects. The waterview from Java below Annapolis remains unrivaled, though the house today stands a ruin. But Mount Clare on the Patapsco long ago lost its view to the industry of Baltimore.

In Virginia three great 18th century mansions -- one on the Potomac and two on the James -- still command their waterfronts. Lee's Stratford on the Virginia side of the Potomac retains its original roof decks within groups of huge chimneys linked by arches. Somewhat later (1730) William Byrd built Westover right on the James. Its riverfront facade matched any English mansion (such as Coleshill and Thorpe Hall) in classical feature and elegance, but its master made it the nerve-center of his 200 square miles of land. On higher ground twenty years later, Robert Carters' Carter's Grove took even fuller advantage of its waterview and turns its richer face toward the James and the approaching ships.[134]

Of course it would take a Frenchman who had the eye for

what was wrong with the esthetic of Bay building: Mederic Moreau de St. Mery visited Norfolk in 1794 and complained about the new houses springing up in the direction of the Elizabeth River and of the new wharves built in haphazard arrangement "put up solely for the convenience of the owner and built without any general plan, and inconsiderately shut off the view of the river."[135]

But commerce was not everything, of course. Residents have long delighted in the Bay for recreation. Since the time of the Seventeenth century's Major Robert Sewall and his ketch Susanna (1689), private boats have been skimming pleasurably across uncrowded ways.[136] The boats became more and more handsome. In 1760 we have record of an organized regatta. An advertisement in the Baltimore American of pleasure boats for hire on Fells Points gives authenticity to the idyllic waterscape in the popular aquatints and other engravings of Baltimore Harbor about 1825.[137]

Lower down the Bay, about 1800, the schooner Dolphin carried "on board a number of Gentlemen on a party of pleasure." The reported added that with a seine and a variety of fishing tackle they were "abundantly supplied with fish . . . and to crown their felicity, they found no vessel in the bay able to sail with them [that is, capable of outsailing them]."[138]

In this region of clean estuaries and marshes, sky-full of ducks and geese attracted hunters whose bag had no limits. By 1814, we are assured, hunters were using "wooden figures cut and painted so as to represent ducks."[139] And the Chesapeake Retriever was bred for hunting from breeding a pair of Newfoundlands crossed with water spaniels.[140]

18th century invalids and health-seekers took the waters at various mineral springs like Berkeley Springs in the mountains of Virginia. In 1821 those people had the option opened to them to reside by the Chesapeake at Old Point in Hampton Roads.[141] The hotel called Hygeia flourished as a health resort there. In 1854, at Ocean View invalids were welcome too. Recreation there included fishing, walking on the beach, riding, and hunting.

In the latter part of the 19th century a new pleasure surprised the burgeoning population, bathing from beaches. A dignity far above the Tom Sawyer level of skinny-dipping settled over resorts like Betterton on the Eastern Shore of Maryland when ladies in black stockings and skirted bathing-dresses disported on the sand. They looked like penguins. The first municipal bathing beach opened in Canton, just east of Fells Point, Baltimore, in 1893. It was fitted out with floats, ropes, and crude cabins for changing. And suits could be rented. The next year bathers numbered 27,787.[142]

And at that very time just east of this beach, the Back River approached the end of its long usefulness for recreation. The 547 acres at the western end of the Eastern Avenue Bridge was selected for the Baltimore City Sewage Treatment Plant (1911).[143]

Few people in the 20th century could just walk down to the shore for a seine hauling anywhere, anytime, and find the rewards celebrated in these lines written in 1754. The author and his gentlemen and lady friends took a picnic down on Severn River and listed their supplies:

> Six bottles of wine, right old, good and clear --
> A dozen at least of English strong beear;
> Six quarts of good rum, to make punch and gross . . .
> A large piece of cheese, a table-cloth too --
> A sauce-pan, two dishes, and a cork-screw; . . .
> A frying pan, bacon or lard for to fry --
> A tumbler and glass to use when we're dry; . . .
> Some vinegar, salt, some parsley and bread --
> Or else loaves of pone to eat in its stead;
> And for fear of bad luck at catching of fish --
> Suppose we should carry -- a Ready Dress'd Dish.[144]

Section III Notes

1. William J. Hargis, Jr. traces the growth of knowledge of the region and offers a summary of early exploration in a paper presented at the Bi-State Conference on Chesapeake Bay, April 1977, Exploration and Research in Chesapeake By: Being a Brief History of the Development of Knowledge of the Bay of Santa Maria, VIMS Contribution No. 837, pp. 14-48.

2. A hundred years later than Brother Carrera, and Englishman also noted beauty combined with profit:

> Mary-Land is a Province situated upon the large extending bowels of America under the Government of the Lord Baltimore, adjacent Northwardly upon the confine of New-England, and neighboring Southwardly upon Virginia, swelling pleasantly upon the Bay of Choesapike . . . being within her own imbraces extraordinarily pleasant and fertile. Pleasant in respect of the multitude of Navigable Rivers and Creeks that conveniently and most profitably lodge within the armes of her green, spreading, and delightful Woods . . . . [all one sentence and ten lines more]

   George Alsop, A Character of the Province of Maryland, London, 1666, edited by William Gowans, 1869, Maryland Historical Society Fund Publication, Vol. I, pp. 443-4.

3. Richard Hakluyt, Discourse on Western Planning, quoted in John W. Reps, Tidewater Towns: City Planning in Colonial Virginia and Maryland, University of North Carolina Press, Chapel Hill, 1972, p. 24.

4. Virginia Council of the London Company, quoted in Reps, p. 31.

5. Carville Earle, "Environment, Disease, and Mortality in Early Virginia," The Chesapeake in the Seventeenth Century: Essays in Anglo-American Society, T. W. Tate and D. L. Ammerman, eds., W. W. Norton, N.Y., 1979, p. 103. Contemporary evidence appeared in this statement of an Englishman who was there: "There were never Englishmen left in a forreigne Country in such miserie as we were in this new discovered Virginia . . . . Our drinke cold water taken out

of the River, which was at a floud verie salt, at a low tide full of slime and filth, which was the destruction of many of our men." George Percy's "Account of the Voyage to Virginia and the Colony's First Days," quoted in Warren M. Billings, ed., The Old Dominion in the Seventeenth Century, University of North Carolina, Chapel Hill, 1975, pp. 22-23.

6. John Smith, quoted by Hamilton Owens, Baltimore on the Chesapeake, Doubleday, Doran & Co., Garden City, N.Y., 1941, pp. 8-9.

7. The Virginia Council of the London Company, quoted in Reps, p. 31.

8. R. V. Coleman, The First Frontier, Schribner's, N.Y., 1948, p. 271.

9. Evidence of the appetite for arable land appears in an advertisement in the Virginia Gazette, Williamsburg, August 29, 1771: "A plantation for sale in King and Queen County, just below West Point, known by the name of Gough's Point, containing two hundred acres . . . . on which is a good Deal of Marsh that with little Expense might be made a valuable Meadow."

10. Marion L. Starkey, Land Where Our Fathers Died: The Settling of the Eastern Shores, Doubleday, Garden City, N.Y., 1962, p. 113. The Charter of Maryland of 1696 gave the Baron of Baltimore authority over all the region in the sea within ten marine lengths of shore and with all ports, harbors, bays, rivers, etc. (IV). In addition, the Baron of Baltimore had authority to construct seaports, harbors, etc., subject to the public's right to fish (XVI).

11. Government officials persisted in authorizing the establishment of towns. Most efforts failed. When an earlier Baltimore, laid out on the banks of the Bush River in Harford County, Maryland, did not develop, it was replaced by another Baltimore in 1729 on the present site. Again the Maryland colonial assembly took great pains in 1744 to establish Charlestown, in Cecil County on the Susquehanna, by giving special privileges to owners of waterfront lots. Similar lures succeeded better at Georgetown, Maryland. The commissioners for the new District of Columbia published regulations on July 20, 1795 permitting proprietors of water lots to build wharves "as far out as they think proper" (but not injuring the channel). Saul K. Padover, ed., Thomas Jefferson and the National Capital, 1783-1818, D.C., 1946, p. 326. In 1694 both Annapolis, on the western shore, and Oxford, on the eastern shore, of Maryland were made official ports of entry by the Maryland Assembly.

Then, in 1699, Williamsburg was founded in Virginia.

12. Reps, p. 46.

13. Population figures come from R. C. Simmons, The American Colonies from Settlement to Independence, David MacKay, N.Y., 1976, p. 171.

14. In 1705 an advertisement appeared in London called "A Plain and Friendly Perswasive to the inhabitants of Virginia and Maryland for promoting towns and cohabitation": "Cohabitation would not only employ thousands of people . . . others would be employed in hunting, fishing, and fowling, and the more diligently if assured of a public market." Reprinted in Virginia Magazine of History and Biography, Richmond, 1897, Vol. 4, p. 261.

15. Reps, p. 98 and p. 100.

16. Daniel J. Boorstin, The Americans: The Colonial Experience, Random House, N.Y., 1958, p. 108. A contemporary comment illuminates the problem: "No country in the world can be more curiously watered. But this conveniency that in future times may make her like the Netherlands, the richest place in all America, at the present I look on the greatest obstacle to trade and commerce." Quoted in Boorstin, p. 106.

17. Quoted in Starkey, p. 111.

18. Later, in 1765, Col. Landon Carter, owner of a great Virginia plantation, recorded in his diary for October 3, "This is a strange ague and fever season. The whole neighborhood are almost every day sending to me." William and Mary College Quarterly, Vol. 13 (1905), p. 159.

19. Population figures, Simmons, p. 171. A visitor to the Chesapeake Bay region in 1785 commented, "Alexandria [Virginia] has made considerable advances since 1778, but afforded no comparison, in its progress, to its vigorous rival, Baltimore [Maryland]." Ethelyn Cox, Historic Alexandria, Virginia, Street by Street: A Survey of Existing Early Buildings, Historic Alexandria Foundation, Alexandria, Va., 1976, p. xiv.

20. Even moving the new nation's capital to the shores of the Potomac failed to creat a city for years. Note that the largest marsh in D.C. was reclaimed only after 1900.

21. The Reverend Hugh Jones, Present State of Virginia, London, 1724, quoted in Proceedings of the Bi-State Conference on the Chesapeake Bay, 1977, p. 66.

22. Daniel J. Boorstin, The Americans: The Colonial Experience, Random House, N.Y., 1958, p. 108.

23. These Virginia and Maryland planters ruled over kingdoms. George Washington owned a mere 8,000 acres, small compared with the 63,093 acres of Robert Carter, of Nomini Hall, Virginia. A Guide to the Architecture of Washington, D.C., Praeger, N.Y., 1965, p. 3.

24. Coleman, p. 270.

25. Thomas J. Wertenbaker, quoted in Annapolis: Intellectual Life Around the Punch Bowl," a brochure published by the Maryland Department of Economic Development, Annapolis, Md., n.d.

26. The English settlers by the end of the 17th century had changed both the place and themselves, although they still regarded themselves as English. "They had a temperamental willingness to accept change as a manifestation of good." Warren M. Billings, ed., The Old Dominion in the Seventeenth Century, University of North Carolina, Chapel Hill, 1975, p. 323.

27. Boorstin, p. 172. "[17th century Virginians] passed on habits and experiences that their fellow countrymen would one day translate into fundamental rights upon which to lay the foundation for a nation." Billings, p. 324.

28. Hamilton Owens, editor of the Baltimore Sun in Mencken's day, who published the story of the port of Baltimore in 1941, called Stevenson the Remus of this future metropolis of the Bay, Baltimore on the Chesapeake, p. 38.

29. John H. B. Latrobe used this phrase about men he knew in his youth, just after the turn into the 19th century -- Samuel Smith, Robert Gilmore, Robert Oliver, and other merchant-princes.

30. John Smith, quoted in Robert H. Burgess, This was Chesapeake Bay, Cornell Maritime Press, Cambridge, Md., 1963, p. 4.

31. Alan D. Anderson, The Origin and Resolution of an Urban Crisis: Baltimore 1890-1930, Johns Hopkins University Press, Baltimore, 1977, p. 69.

32. Md. Laws (1792).

33. Baltimore City Council, quoted in J. Thomas Scharf, Chronicles of Baltimore, Turnbull Brothers, Baltimore, 1874, p. 303.

34. Baltimore Gazette and Daily Advertiser, 1/15/1830. The news report goes on to say the Water Company is "chaining down our fellow citizens to a prolonged subsistence on this muddy substitute for the pure element." People lived in fear of resorting to "pumps which we have found it necessary to abandon, and imbibe disease and putrid water together." Almost as bad as disease was the threat of having to "relinquish the design of multiplying our houses, our streets, and our people." For a booming town that threat must have hit hard.

35. Thomas J. Wertenbaker, Norfolk: Historic Southern Port, Duke University Press, Durham, N.C., 1941, p. 134.

36. Md. Law Ch. 79 §13 (1808).

37. The word polluting appeared in this act, an early use of the term in the modern sense.

38. Md. Laws Ch. 6 (1886).

39. Md. Laws Ch. 355 (1874).

40. Report of the Baltimore Water Commissioner, 1853, p. 142.

41. Baltimore v. Warren Manufacturing Co., and Summerfield Baldwin, 59 Maryland Reports, p. 84 (1882).

42. Commonwealth v. Webb, 6 Rand (27 Virginia Reports), p. 726 (1828).

43. Miller v. Truehart, 4 Leigh (31 Virginia Reports), p. 569 (1833).

44. The discoveries about causes of epidemics of diseases came about in part through the efforts by two men from the Bay area both Baltimoreans, Dr. Jesse Lazear (yellow fever) and Dr. Thomas Buckler (cholera). For the story of Dr. Lazear see Alan M. Chesney, The Johns Hopkins Hospital and the Johns Hopkins University School of Medicine: A Chronicle, The Johns Hopkins Press, Baltimore, 1943. And for the contribution of Dr. Buckler, see his A History of Epidemic Cholera, Baltimore, 1851, and "The Almshouse at Calverton: The Beginning of Scientific Medicine," Maryland State Medical Journal, Vol. 15 (May 1966), p. 84, which treat Buckler's report on the almshouse and its being a pest-house. For a specific case of filth in Baltimore, Buckler reported in his history that in 1832 there were nine deaths from cholera during a few days, in a cluster of houses included in about half the square bounded by Hamilton, Centre, Charles and St. Paul Streets. "When the local causes of this group of cases was inquired into,

it was ascertained the a number of pig-styes were kept by some free negroes, whose houses were only accessible by narrow alleys running into St. Paul Street. The filthy condition of these places beggars description." Buckler, A History of Epidemic Cholera, Baltimore, 1851, pp. 30-31.

45. George D. Armstrong, M.D., History of Yellow Fever in Norfolk, Philadelphia, 1856.

46. Md. Laws Ch. 93 (1801).

47. Md. Laws Ch. 200 (1874).

48. Md. Laws Ch. 12 § 1 (1886).

49. Charles Varle, A Complete View of Baltimore with a Statistical Sketch, etc., Baltimore, 1833, p. 11.

50. Dr. Thomas Buckler, Baltimore: Its Interest -- Past, Present and Future, Baltimore, 1873, p. 10.

51. Buckler, A History of Epidemic Cholera, Baltimore, 1851, p. 40.

52. William Travis Howard, Public Health Administration and the Natural History of Disease: 1797-1920, Washington, Carnegie Institute of Washington, 1924, p. 83.

53. Sherry Olson, Baltimore, Johns Hopkins Press, Baltimore, 1980, pp. 54, 92.

54. Md. Laws (1766).

55. Buckler, Cholera, p. 20.

56. Interview, August, 1980.

57. Boorstin, p. 238.

58. Thomas E. Bond, Report of Baltimore Public Health Department, Baltimore, 1825.

59. Quoted in Reps, p. 216.

60. Margaret Leech, Reveille in Washington, Harper, N.Y., 1941, p. 77.

61. Buckler, Past Follies and Present Needs, Baltimore, 1874, p. 49.

62. Clayton Coleman Hall, Baltimore: Its History and Its People, N.Y., 1912, p. 424.

63. Gleason's Pictorial Drawing-Room Companion, ca. 1855, p. 218.

64. Anderson, p. 66.

65. In the 1890's "The Back Basin . . . received the effluence of such sewers as existed and emitted a stench as cadaverous and unearthly as that of the canals of Venice . . . . During the crusading era the local newspapers often set up demands that something be done about it, but it continued to afflict the town until the new sewerage system was completed, and the Back Basin was reduced to the humble status of a receptacle for rainwater. Once a Herald editorial writer proposed in print, and quite seriously, that a dam be built across the mouth of the Basin, to the end that the water backed up at high tide might be released suddenly when the tide was low. His theory was that the resultant flood would carry off all the dead dogs, decayed bunches of bananas and the multitudinous worse filth that floated on the Basin's surface. When an Old Subscriber wrote in asking what would happen to the shipping in the lower harbor when this flood roared down the Patapsco, the editorial writer was indignant, and accused various reporters of writing the letter." H. L. Mencken, Newspaper Days, Alfred A. Knopf, N.Y., 1943, pp. 53-54.

66. Buckler, Past Follies and Present Needs, Baltimore, 1874, p. 19.

67. Milo W. Locke, Harbor of Baltimore: Locke's Plan, Baltimore, 1875. See all H. W. Shure's presentation of the plan by Rolin Bestor of Jersey City, N.J., for purifying Baltimore Harbor, 1877, to cost $200,000 and to cleanse 1,800,000 gallons per hour. Inventory #1717, Baltimore City Department of Surveys, City Hall Annex, Holliday Street.

68. Baltimore City Council, June 1795.

69. Frank Shivers, Bolton Hill: Baltimore Classic, Baltimore, 1958, p. 12.

70. Sir George Campbell, M.P., White and Black, N.Y., 1879, p. 257.

71. Baltimore City Council notation in manuscript in the Corner Collection, M.H.S. for February 1768.

72. Reps, p. 126.

73. Harold K. Kanarek, The Mid-Atlantic Engineers: A History of the Baltimore District U.S. Army Corps of Engineers,

1774-1974, Washington, 1977, p. 117 passim.

74. This plentifulness of fish was attested to many times in writing, as, for example, by George Alsop, a 17th century observor, in his "A Character of the Province of Maryland," "As for fish, which dwell in the watery tenements of the deep, and by a providential greatness of power, is kept for the relief of several Countries in the world (which would else sink under the rigid enemy of want), here in Maryland is a large sufficiency, and plenty of almost all sorts of Fishes, which live and inhabit within her several Rivers and Creeks, far beyond the apprehending or crediting of those that never saw the same, which with very ease is catched, to the great refreshment of the Inhabitants of the Province." (London, 1666, quoted in Maryland Historical Society Fund Publication, vols. 11-15, p. 450.) The flavor of the seafood also came in for comment, as on October 13, 1765 William Gregory noted in his journal, "I put up at Midton's [Annapolis]. Fine oysters to be had." The next day he wrote, "I set out for Joppa about 12 o'clock and arrived here just at 8 o'clock. Pretty large vessels coming up to this place. Good oysters . . . . Gunpowder river runs past here." William Gregory's Journal from Fredericksburg, Va. to Philadelphia," in William and Mary College Quarterly, vol. 13 (1905), p. 226.

75. John Smith, quoted in Billings, p. 215.

76. George Percy, Account of the Voyage to Virginia and the Colony's First Days, quoted in Billings, ed., The Old Dominion in the Seventeenth Century, pp. 22-23.

77. These gifts of seafood were not well received by Col. Landon Carter of Sabine Hall in the Northern Neck on the Rappahannock River, as he recorded in his diary of 1770. Perhaps Carter had reason for being so irascible; he seems to have felt keenly the defection of "a dear girl":

> This morning two dozen of Trout came from Captain Beale, but I want no communication with a man who must have been concerned in his son's fascinating a dear girl away from me, tho' I don't suppose him concerned in that vile behavior shown to me by the monster, his son, sometimes before my deluded child went away. I say I want to drop all connection with this father, by much too guilty in effecting that, my certain misery. Yet as he shewed a kindness to the family, indeed his blood relations to the marriage of his daughter with my son, I thanked him in their behalf, and ordered a bushel of Bernard Creek oysters to be returned. I shall not eat of these fish . . . .

"The Diary of Colonel Landon Carter, of Sabine Hall in the Northern Neck of the Rappahannock River," William and Mary Quarterly, vol. 13 (1905), p. 42. Percy also put together Observations Gathered Out of a Discourse of the Plantation of the Southerne Colonie in Virginia, in Purchase His Pilgrimes, 1606, London, 1625 (reprinted in Edward Arber and A. G. Bradley, Travels and Works of Captain John Smith, Edinburgh, 1910, Vol. 1, p. lxii). In it he noted that the mussels and oysters lay on the ground as thick as stones. "We opened some and found in many of them pearls." A letter from the Council in Virginia to Council in England dated June 22, 1607, attests to the sweet sturgeon in the James River:

> We are set down eighty miles within a river, for breadth, sweetness of water, length navigable into the country, deep and bold channel, so stored with sturgeon and other sweet fish as no man's fortune has ever possessed the like. And, as we think, if more may be wished in a river it will be found.

Quoted in Alexander Brown, The Genesis of the United States, Boston, 1891, vol. 1, p. 107.

78. See Garrett Power, Chesapeake Bay in Legal Perspective, Government Printing Office, 1970, pp. 81-83.

79. Disposing of the tidewater, subject to public rights of fishing, was the way local governments encouraged commerce. In 1745, for example, the Maryland General Assembly decided that "all improvements, of what kind so ever, either wharfs, houses or other buildings, that have or shall be made out of the water, or where it usually flows shall [as an encouragement to such improvers] be forever deemed the right, title and inheritance of such improver." Md. Laws, ch. 9 (1745). Then, in 1759, wharves 1000 feet long were built by John Smith, William Buchanan, and William Spear. Without this lengthy wharfage to deep water, Baltimore would not have grown as a port. Emerson L. Dorsey, Jr., "A Legal History of the Port of Baltimore," U.M.L.S. ms., 1978, p. 4. The enthusiasm for oysters led a group of five 17th century Virginians to break the sabbath. When discovered, they had a canoe full of oysters. But they escaped punishment, and presumably kept the oysters, because the sick wife of one of them had a craving for oysters, and on Saturday her husband had been kept from going out and tonging them by the wind. Susie M. Ames, Studies of the Virginian Eastern Shore in the Seventeenth Century, Russell and Russell, N.Y., 1940, p. 185.

80. Billings, p. 321.

81. Md. Laws (1796).

82. Virginia Constitution, section 175.

83. Carl N. Everstine, The Compact of 1785, Research Report No. 26, Legislative Council of Maryland (September 1946). Under the 1785 Maryland-Virginia Compact, full property rights along the shores were guaranteed to citizens of both states, including fishing rights. All laws to preserve fish had to be made with the consent of both states.

84. Among these regulations, those in Acts of Assembly Now in Force in the Colony of Virginia for 1769 order that owners of mills, hedges, and stone stops shall make openings for passage of fish.

85. 6 Hen. 69 1748, ch. 29 §§1-3.

86. Owners of Mills were ordered to make slopes for the passage of fish by the following Virginia laws.

    Rivanna and Hedgeman Rivers, 8 Hen. 361 §81;

    Meherrin River, 8 Hen. 583, 1772 ch. 33;

    Rapidan River, 9 Hen. 579, 1778 ch. 39;

    7 Hen. 321, 1759 ch. 32. Amended 7 Hen. 590 (for Appomatox River);

    7 Hen. 423, 1761 ch. 20;

    7 Hen. 321, 1759 ch. 32, and, amended to include the Appomatox River, 7 Hen. 590.

87. Allan Howard's mill was torn down because it entirely obstructed the passage of fish (7 Hen. 423, 1761, ch. 20).

88. Patuxent, Maryland Laws ch. 70 (1802); Monocacy, Maryland Laws ch. 79 (1806); Susquehanna, Maryland Laws ch. 91 (1813); Pokomoke, Maryland Laws ch. 70 (1862).

89. Back in the 17th century the Council and Burgesses of Virginia apprised the governor of the "great mischiefs and inconveniences" that killing whales in the Chesapeake "accrew to the inhabitants." The reason: by these killings "great quantities of fish are poisoned and destroyed and the rivers also made noisome and offensive." Council Papers of Virginia, 1698, Virginia Magazine of History and Biography, Richmond, 1913, vol. 21, p. 76.

90. A Maryland journalist who traveled in the early 19th century around the United States, reported on the large fisheries for herring (and shad) at the mouth of the Susquehanna: the fish were taken in large nets "from 108 to 200 fathoms in length spread across the river by boats. The ten fisheries employed fourteen to fifteen men each at fifteen dollars per month, with their provisions, to catch, cure, and pack the herrings in barrels." The author added: "These fishermen make a wretched appearance, they certainly bring up the rear of the human race. They were scarcely covered with clothes, were mostly drunk, and had the looks of the veriest sots upon earth." Anne Royall, Sketches of the History, Life and Manners in the United States, New Haven, 1826, pp. 109-148 passim. Fisheries were subject to regulations about polluting also. In 1810 the Maryland Assembly ordered them to remove the pickle used in their operations, to clean their slips, and to remove all fish from shores within ten days of the end of the season. Maryland Laws, ch. 95 (1810).

91. Legislation intended to preserve fisheries in Maryland:

-- Forbidding improper seines whose use covered oysters with mud, thus reducing the supply, ch. 311 (1834).

-- Prohibiting the use of defective instruments, ch. 310 (1837).

-- Establishing the ownership rights of proprietors and also setting out seasons for oystering. In addition, fines were imposed for throwing oyster shells in the water. Article 71 §15 (1860).

-- Laws designating who may take what, where, when, and how. ch. 184 (1868).

-- Allowing Worcester County to take over regulation of its own oysters. Art. 23 §90 (1868).

-- Licensing requirements for fishing for shad or herring in the Potomac River. ch. 205 (1870); codified in Art. 72 §1 (1888); enacted ch. 296 (1886).

-- Authorizing the Board of Public Works to purchase guard boats, guns, and ammunition, and to create a fishery force, charged with the control and enforcement of all state laws concerning fish. ch. 296 §23-41 (1878).

-- Preserving diamond back terrapins. ch. 424 §1 et seq.; codified art. 92 §1 et seq. (1888).

92. "It is significant to note that while the population of the United States between 1880 and 1930 increased by 144.8 per cent, the per capita oyster consumption declined by 77.3 per cent." In this period there was an 81.6 per cent decline in annual catch. In 1880 Maryland had 47.5 per cent of the Atlantic and Gulf production, and by 1930 it had only 15.4 percent. Conservation Problems in Maryland, State Planning Commission, February, 1936, p. 3.

93. Phipps v. Maryland, 22 Maryland Reports, p. 38 (1864).

94. McCready v. Virginia, 94 United States Reports, p. 391 (1876).

95. Garrett Power, "More About Oysters Than You Wanted to Know," Vol. 30 Maryland Law Review (1970), pp. 202-210.

96. Md. Laws ch. 311 (1834).

97. Md. Laws Art. 71 §15 (1860); also, ch. 184 (1867) on who may take what, where, when, and how.

98. Va. Laws, 3 Hen. 46, 47 (1691).

99. Va. Laws ch. 36 §13 (1748). Penalties were periodically imposed, including one for casting dead bodies into rivers (3 Hen. 353, ch. 27 1705).

100. Paul S. Dulaney, The Architecture of Historic Richmond, Richmond, 1976, p. 2.

101. Robert H. Burgess, This was Chesapeake Bay, Cambridge, Md., Cornell Maritime Press, 1963, p. 47.

102. Reps, p. 222.

103. Va. Laws, 2 Hen. 455, ch. 31 (1679).

104. Va. Laws, 2 Hen. 484, ch. 15 (1680).

105. Va. Laws, 4 Hen. 111, ch. 7 (1722).

106. Va. Laws, 4 Hen. 177, ch. 7 (1726).

107. Va. Laws, 4 Hen. 375, ch. 18 (1745).

108. 4 Har. & M. Ch. 547 (1774).

109. Md. Laws ch. 5 (1768).

110. Md. Laws (1783).

111. Md. Laws ch. 45 (1791).

112. Md. Laws ch. 45 §7 (1791).

113. Virginia legislators responded with the following laws which provided:

-- for the clearing of the Appomatox and Pamunkey rivers, 6 Hen. 394, 1752, ch. 40.

-- for clearing the James and the Chickahominy rivers and extending navigation, 8 Hen. 148, 1765, ch. 34.

-- for clearing the Great Falls of the James and extending navigation. 8 Hen. 148, 1765, ch. 34.

-- for extending navigation on the Potowmack from Fort Cumberland to the Tidewater, 8 Hen. 570, 1772, ch. 31.

-- for improving navigation, incorporation of the James River Company, 11 Hen. 450, 1784, ch. 19, and for other improvements, 11 Hen. 341, 1783, ch. 25.

-- opening and extending navigation of the Potomack and the Potomack Company incorporated, 11 Hen. 510, 1784, ch. 43.

-- opening, extending navigation on the Appomatox, 12 Hen. 591, 1787, ch. 53, and for the same on the Chickahominy, 12 Hen. 382, 1786, ch. 92.

114. Md. Laws ch. 154 §18 (1817).

115. Md. Laws ch. 75 (1814).

116. Md. Laws ch. 35 §3 (1800).

117. From 1800 on, regular dredging was done in the Potomac at Georgetown, Washington, and Alexandria. By 1863 soil pollution poses definite problems along the Potomac. Kenneth Lasson, "A History of Potomac River Conflicts," in Legal Rights in Potomac Waters, p. 27.

118. de Gast, The Bay, p. 1.

119. M. Gordon Wolman, in Proceedings of Governor's Conference on Chesapeake Bay (1968).

120. Deric O'Bryan and Russell McAvoy, Gunpowder Falls, Md., Geological Survey Water Supply Paper, 1966, p. 6.

121. Md. Laws (1753).

122. Md. Laws (1783).

123. Md. Laws (1872).

124. Olson, p. 55.

125. Kenneth Lasson, "A History of Potomac River Conflicts: Legal Rights in Potomac Waters," Annapolis, 1976, p. 27.

126. Wolman, Proceedings, p. II 26.

127. Garitee v. Baltimore, Vol. 53 Maryland Reports, p. 422 (1880).

128. Baltimore and Ohio Railroad v. Chase, 43 Maryland Reports at p. 35 (1875).

129. Norfolk City v. Cooke, Virginia, Vol. 27 Gratt, p. 430 (1836).

130. Attitudes toward regulation and towards attempts by the government to impose its will on the water may be reflected in the following article from a newspaper of 11/19/1868, published in a Maryland town on the Susquehann River, the Havre de Grace Republican:

> The much talked of breakwater the government recently put in the river opposite the light house looks as if it has been on a "bust." Old Susquehanna has been turning the tables and amusing herself in smashing and breaking the breakwater and all in the most cool, calm, and pleasant manner imaginable, giving evidence of what she can do when she gets her "dander" up, and sends her angry floods in their resistless power.
>
> We understand the government is about taking the plank and frame work up and putting them in some sheltered place for safety through the winter. We suggest the only safe place is high and dry on shore where they will do about as much good in keeping open the channel of the river, as in their present location.

131. Reps. p. 70.

132. Reps, p. 75.

133. Brochure, Mount Vernon Ladies' Association of the Union, Mount Vernon, Va., 1978.

134. Stratford probably was designed by the Royal Words Circle in London. The chimneys (but not the view) resemble those of Claremont, designed by Sir John Vanbrugh twenty years earlier. (Sir John Summerson, The Pelican History of Art: Architecture in Britain, 1530-1830, Penguin, Hammondsworth, Middlesex, 1970, p. 542.) John Ariss advertised in the Maryland Gazette in 1751 as "lately from Great Britain," and capable of "buildings of all sorts and dimensions . . . either of the Ancient or Modern order of Gibbs, Arch." Ariss was born in Virginia, educated in England, and represented a new type of trained professional builder/ designer who collaborated with their gentlemen-patrons who had ideas but no technical knowledge. Ariss wrote books on how to follow Gibbs, the leading English architect. No single British house served as the source for Virginia's mansions. But prototypes includes Coleshill, Bershire, probably by Roger Pratt ca. 1650 and Thorpe Hall, Norfolk, by Peter Mills, 1653-56. Alan Gowans, Images of American Living, Harper & Row, N.Y., 1976, p. 133.

135. Reps, p. 4.

136. M. V. Brewington, Chesapeake Bay: A Pictorial Maritime History, Cornell Maritime Press, Cambridge, Md., 1956, p. 221.

137. Brewington, p. 223.

138. Brewington, p. 222.

139. Brewington, p. 223.

140. Swepson Earle, The Chesapeake Country, Thomsen-Ellis Co., Baltimore, 1929, p. 265.

141. Wertenbaker, Norfolk, pp. 294-95.

142. Md. Historical Society Magazine (1950), p. 201.

143. Daniel Cooke, Impact of Pollution on the Water Oriented Activities of Back River, Md., University of Tennessee M.S. Thesis, 1968, Enoch Pratt Free Library.

144. Maryland Gazette, August 20, 1754, reprinted in J. Thomas Scharf, History of Maryland, Baltimore, 1879, vol. 2, p. 13.

SECTION IV

THE TURN OF THE CENTURY

We have discussed the development of the Bay region over its first 300 years, and described the origins of various uses of the Bay and its resources. We now look more specifically to the water quality issues which emerged by the beginning of the twentieth century.

The nineteenth century saw the development of four important forces that directly influenced the Bay. Foremost was the development of the cities of Hampton Roads, Richmond, Washington, and Baltimore. With them came the need for water supply and municipal sanitation. Concurrently developing was the large scale use of the Bay as a waste placement sink. This use was related both to the growth of cities and their water supplies, and to the growth of industry. Deepwater navigation by merchant ships was also on the rise. Last in economic importance, but perhaps first in terms of political attention, was the growth in commercial fishing, most particularly the oyster fleet.

Paralleling these developments was a growth in government. By the turn of the twentieth century more governments were promulgating more laws and regulations which influenced the Bay. As the cities of the Bay region grew, they had to deal with the problem of municipal sanitation. Springs and small streams gradually proved inadequate to supply water for the growing populations, which by the latter part of the nineteenth century began to seek the advantages of indoor plumbing. The solution in the Bay towns as elsewhere was to form municipal water companies and distribute the water through a central system. Richmond and Washington were able to use the large flow of the James and Potomac Rivers, while Baltimore reached out into the surrounding country to impound small rural streams. The Norfolk area was forced to rely almost entirely on wells. By the 1870's, all the Bay's cities were using substantially more water per capita, not only for domestic use but for street cleaning, fire protection, and industry.[1] This water, laden with wastes, quickly reached the Bay. Because of the relatively sluggish tidal exchange rates of the Patapsco basin in Baltimore, the upper Potomac estuary in Washington, and the small tidewater creeks off Hampton Road, these waters all were directly offensive to the senses, at least at certain times of the year by the end of the Civil War.[2]

Concurrent with municipal growth was the concern for controlling contagious or epidemic diseases. Prior to the last decade of the nineteenth century, the prevailing theory was that miasmas, or foul air, transmitted most of the diseases then highly feared, such as cholera, dysentery, and yellow fever. Special attention was, therefore, given to municipal drainage, to the elimination of swamps, and to the design of sewers, so that the latter would not result in the build-up of sewer gas. Contaminated water had, of course, also long been recognized as a source of disease, although the causal agent had not been determined until the germ theory of disease was established just before the turn of the century.[3]

As the result of this interest in water supply, wastewater removal, and public health, the cities around the Bay formed public works bureaucracies starting with municipal water companies, and then going to sewerage commissions.[4] At about the same time, local and state agencies were formed to study public health issues, apply quarantines, and police sanitary practices.

The Bay and its tributaries have been used for waste placement ever since the area was settled. By the nineteenth century, there was an abundance of statutes in both Bay states prohibiting the dumping of various injurious substances into waterways.[5] These statutes were enforced by local sheriffs, if at all. One can surmise that the refuse from sawmills, slaughterhouses, and canneries, all of which were addressed in some way, were sufficiently abundant and obnoxious to provoke objections from fishermen and shoreline property owners.

By the end of the nineteenth century, larger industries were taking their places in and around the Bay, and there was a sizeable increase in vegetable canning and other food processing operations. Add to that the discharges from municipal sewers, and it seems evident that the Bay was receiving a greatly increased load of man-produced wastes. Except in Baltimore Harbor, which we will discuss in the next section, this increased waste loading did not appear to provoke any great outcry other than perhaps the local objections to specific discharges on specific creeks. In summary, there was evidence of increased waste discharges, concommitant with increased population and economic growth, but not direct government attention to it.

The nineteenth century was a period of intense national interest in improving waterborne transportation. In the Bay region this centered on the development and enlargement of the Chesapeake and Delaware Canal, the approach channels and port facilities of Hampton Roads, Richmond, and Baltimore, and the various canal schemes and projects to link Richmond and Washington with the interior, of which the Chesapeake and Ohio Canal was the most important.[6] Canals were to be supplanted by the railroads, which made the deepwater ports of Baltimore and

Hampton Roads prominent and prosperous. Conflicts between shippers and other users were occasional and minor. Oystermen in the Baltimore area claimed that dredged channels destroyed oyster bars, and shipping interests claimed that oyster dredges damaged the shipping channels. But the growth of shipping set the stage for two large conflicts: for the first half of the twentieth century, oil discharged from ships as they pumped their bilges was one of the worst pollution problems on the Bay; and, since about 1960, the problem of what to do with the material dredged from shipping channels has caused major controversies.

Commercial fishing on the Bay prior to the nineteenth century was primarily for local consumption and attracted relatively little political attention. By the early part of the nineteenth century, New England oystermen were making raids on the abundant oyster bars of the Chesapeake. The New Englanders were taking oysters to northern markets centered in New York and Philadelphia, and were using Bay seed oysters to restock their bars, which had been stripped by earlier generations of New England fishermen. Both Virginia and Maryland moved to prevent out-of-staters from capitalizing on the Bay's resources, and there gradually developed a robust Bay oyster industry, which peaked in the 1880's.[7] Despite exclusionary legislation, much of the impetus for this development still came from New Englanders, who financed many of the largest harvesting, processing, and shipping operations.

The development of the oyster industry has been a dominant factor in the evolution of Bay water quality policy and politics for nearly a century. Virtually all of the significant issues over quality have had the welfare of the oyster and the oysterman as central concern. It is, therefore, useful to outline the development of the industry, in order to explain its central importance.

Oysters in Chesapeake Bay are nearly ubiquitous except in the upper, low salinity reaches of the Bay and its tributaries. They occur in commercial quantities on beds variously known as bars, reefs, rocks, or knolls. These bars are potentially self-sustaining. Oyster larvae, which are released by mature oysters in the late spring and spend a period of time as a free-floating part of the Bay zoo-plankton, eventually must settle on a hard surface to begin the development of a shell and their growth to maturity. An ideal surface is the shell of another oyster, living or dead. Thus over time, a favorable site will develop an expanding area and quantity of oysters, built on the shells of oysters that preceded them. In some places these bars grew to within a few feet of the surface, hence the name "reef." It was these natural bars that attracted the New England oystermen, and later provided the crop that reportedly totaled over 20 million bushels a year during the 1880's.[8]

Bars built by nature can also be destroyed by natural means. Long-term freshening of the upper Bay and the Potomac have eliminated once-productive beds leaving vast quantities of shell. The constant shifting of the Bay bottom and erosion of its shoreline have silted over bars that could not grow upward fast enough to keep ahead of the deposits. And natural enemies such as the starfish, the moray eel, or various smaller predators and diseases, could and no doubt did eliminate bars. But in the nineteenth century, and by general reputation still in the twentieth, the Bay was perhaps the most productive natural oyster ground on earth.

Man also can both destroy and build oyster beds, in the latter case requiring assistance of nature. Destruction can be indirect, through the modification of salinity patterns in the Bay or by increasing sedimentation and erosion. Both factors were no doubt in existence during the nineteenth century and earlier, because of changes to soil erosion rates and streamflow caused by land clearance for agriculture and lumbering. There is some evidence that Indians also affected these factors by frequently using fire to improve hunting.

The most dramatic destruction of oyster beds is by overfishing, and it was through this that large areas were rendered non-productive during the heyday of the oyster raids of the late nineteenth century. Despite growing concern for the decline of the industry, and a large body of law to prevent it, beds were stripped of their standing crops of mature oysters, and, in some cases, rendered unfit for future productivity.

On the positive side, man can establish a bed for oyster production, using techniques perfected in France in the early part of the nineteenth century. Oyster shells can be dumped in an otherwise fallow area, and either receive a natural catch of spat, or be provided with seed oysters from another area. Through a process of preparing the ground, planting, thinning, and preventing excessive siltation and predators, man can produce oysters in a fashion analogous to land farming. The productivity of natural bars can also be enhanced using the same techniques.

Government involvement in the oyster industry was, as mentioned, extensive in the nineteenth century. The "oyster question" occupied much of the time of both state legislatures. The first task was to prevent outsiders from stripping the bounty of the Bay. The second was to prevent residents from over-harvesting. The third was to resolve the various disputes between different counties, since most regulation was done on a county-by-county basis. The fourth was to address differences between hand tongers, who generally worked the more protected and shallow waters of the Bay's tributaries, and the dredgers, who worked the larger bars and were regarded as the chief

sources of oyster bar destruction.

Last, but not least, the legislatures had to address the question of whether to allow the leasing of Bay bottom for the farming of oysters. Clearly it would not be profitable to go to the expense of developing a bed if someone else could harvest it. It was the opinion of many who watched the great oyster boom that the future of the industry lay in private oyster culture. The oystermen who made their living harvesting naturally grown oysters did not want to be denied that opportunity. In Virginia, therefore, the solution was to establish that all natural bars, as delineated in a late nineteenth century survey, were to remain as common property resources, open to harvest by anyone who met residency requirements and who observed laws relating to licensing, gear, and season. At the same time, a method was established to lease fallow bottom to individuals or corporations, thus permitting the development of a substantial private culture, as had been developed in Europe, New York, and New England. Maryland attempted to do essentially the same thing, but public-bed oystermen repeatedly blocked any significant effort to establish a private oyster section in Maryland, so that today the only oyster farming of any size in Maryland is done by the state on public beds. As we shall see, the nature of the oyster industry with respect to public and private access has a definite impact on the definition of water quality problems in Virginia and Maryland.

The growth of oystering in the late nineteenth century was matched by a growth in subsidiary industries. Oysters had to be shucked, canned, packed, and shipped, and these operations employed thousands of workers in the centers of Baltimore, Norfolk, and Crisfield.[9] The economic atlas for the State of Maryland at the turn of the century illustrates not only the numbers of persons involved in the industry, but the fact that they were distributed throughout the tidewater counties.[10] Because each county had a single senator in those days, and the tidewater counties outnumbered their non-tidal counterparts, political representation for the oyster interests were disproportionately large.[11] The welfare of watermen and the well-being of the oyster industry were considerations of great political weight by the turn of the century. In Maryland particularly, the oyster was seen to be a prime economic asset,[12] and this perception, developed by the economic energy of the industry in the late nineteenth century, persists to this day.

The commercial harvest of finfish has never gained anything like the size or political significance of the oyster industry in the Bay states, but it was a matter of considerable attention in the nineteenth century, particularly with respect to shad. Shad runs had apparently supplied a substantial portion of the food of some of the poorer Bay area residents for some time, and reductions in spring runs had been lamented at least since the

1920's. The numerous statutes relating to the damming and blocking of streams were aimed partly at reducing the obstructions to the spawning of shad. Declines in supply had the effect of driving up prices, which was decried as having an unfortunate impact on the poor.[13]

Declines of finfish throughout the Eastern United States had much to do with the formation of the Federal Fisheries Service, which in turn led to the establishment of state fisheries boards in both states soon after the Civil War. These boards, along with the oyster police forces also established during this period, constituted the first steps to creating a state bureaucracy for the management of Bay resources. Although these boards were small in 1900, they provided a permanent government presence that represented the interests of both sport and commercial fishermen. By the early twentieth century, they were to play an important role in addressing water quality issues in both states.

By 1900 the dominant Bay uses of waste placement, navigation, and fisheries were well established, and there was considerable recreational activity as well. Conflicts between these uses were few. The one serious and sustained water quality problem of the nineteenth century, the contamination of Baltimore Harbor, was primarily a nuisance issue, rather than a real confrontation between user groups of the kind that will be shown to dominate the twentieth century. Nevertheless, the stage was set: the politically well established oyster industry was in place; the municipalities of the region had installed (or in the case of Baltimore were about to install) large centralized sewer systems that dumped waste loads that were ever increasing because of the growth of population, the increased use of municipally supplied domestic water, and the wide-scale installation of the water closet; industry was beginning a major expansion as a result of new technology; and accompanying industrial and economic expansion was the growth in the size and number of ships and other commercial craft using the Bay. More quietly, but of considerable importance, growing numbers of Bay residents were making use of the Bay for recreation and as a source of amenity.

Section IV Notes

1. Manual of American Water Works, 1888, Engineers News, N.Y., 1889. Passim.

2. Abel Wolman and John C. Geyer, Report on the Sanitary Sewers and Waste Water Disposal in the Washington Metropolitan Region, 1962.

3. For a particularly lively account of these issues in Baltimore, see Report of the [Maryland] Board of Health 1884, in House and Senate Documents 1884, pp. 28-32 and 140-178.

4. For an interesting summary of this process, see Martin V. Melosi, ed., Pollution and Reform in American Cities, 1870-1930, University of Texas Press, Austin, Texas, 1980.

5. For Virginia, see note III 104, supra; for Maryland, see Acts of 1808, ch. 79, §13; and 1886, ch. 6.

6. See "Maritime Development" in Proceedings of the Bi-State Conference on the Chesapeake Bay, Chesapeake Research Consortium, 1977, pp. 66-69.

7. There is no single study of the Bay oyster industry, although there is an abundance of source materials. For an outline of oyster legislation and production figures from 1810-1910, see Hugh S. Cumming, Investigation of the Pollution of Tidal Waters of Maryland and Virginia, Public Health Bulletin #74, March, 1916, p. 18.

8. William Keith Brooks, The Oyster, Johns Hopkins University Press, Baltimore, 1891 (2nd ed. 1905).

9. For a detailed account of the industry, see "Baltimore: 1870-1900 -- Studies in Social History," Baltimore, Johns Hopkins University Press, 1941, pp. 42-62. Passim.

10. Report of the Bureau of Labor and Statistics, State of Maryland, 1903. Passim.

11. See Harry J. Green, "A Study of the Legislation of the State of Maryland," Baltimore, Johns Hopkins University Press, 1930, pp. 22-24.

12. See, e.g., Governor Oden Bowie, Message to the Maryland General Assembly, 1870, House and Senate Documents, 1870, pp. 18-21. Governor Frank Brown, Message to the General Assembly, 1894, p. 16.

13. See Report on the Fisheries and Waterfowl of Maryland, House and Senate Documents, 1872, Document E, p. 37.

SECTION V

1900-1945

By 1900, the condition of the Baltimore Basin was a long-time topic of agitated debate. In 1893, a sewerage commission was appointed to tackle the problem afresh, since the reports of earlier commissions (1862 and 1883)[1] had not led to action. The commission dutifully set out to study the various alternatives, which it did in great detail, making use of some of the leading authorities of the time. In 1897, it submitted its report,[2] which recommended the building of a sewer that would discharge the untreated wastes of some 350,000 people into the Bay. This approach, which would be unthinkable today, was labeled as the "water carriage-dilution method" of waste disposal, a rather euphonious term for what another writer vividly called the "construction of a great artificial intestine and anus" for the city.[3]

Had the commission done its careful work just a few years before, its recommendation would likely have been acted on. However, in October 1893, an event took place in Connecticut that directly and dramatically affected the outcome of the Baltimore sewer issue, and established what was to become the dominant Bay water quality issue of the next fifty years. A group of Wesleyan College students became ill with typhoid fever after having eaten oysters.[4] Medical science, armed with the newly accepted germ theory of disease, firmly established that the oysters were the direct cause of the disease. The incident received world-wide medical and popular attention, and clearly sent a shock wave through the Bay oyster industry. For the first time, what had been a mere theory, scorned by many, that oysters could cause disease, was now a proven and widely known fact.[5]

The oyster industry, represented both by watermen and packers, voiced forceful objections to the discharge of Baltimore sewage to the Bay.[6] Thus, when the Sewerage Commission submitted its 1897 report, its entire argument was designed to offset the objections of the oyster interests, and to demonstrate that the proposed discharge to the Bay would not cause harm. The Commission pointed out that the only incidents of disease came from oysters taken from confined and poorly circulating waters, whereas the proposed discharge would be rapidly diluted and circulated by the immense volume of water in the

middle of the Bay. It argued that the cities along the Susquehanna were discharging the wastes of over one million people to the Bay, without ill effect. Furthermore, the oyster beds closest to the proposed outfall had been seriously depleted or eliminated by floods of fresh water from the Susquehanna; hence reducing even further any chance of contamination. Indeed, the Bay was so productive because of the runoff from the land: "Your Commission has been advised by an acknowledged authority on all that related to the biology of the oyster that a discharge of the sewage of the city, as here contemplated, would be beneficial rather than injurious to the oysters themselves."[7] Speaking with the assurance borne of careful deliberation and sweet reason, the Commission concluded: "There would appear to be but little reason why the City of Baltimore should deny itself the facilities and advantages which nature has vouchsafed to it namely the diluting effect of the Bay, since the Susquehanna and other towns are doing it anyway. It would be ridiculous to attempt to prevent it . . . . May not Baltimore, as well, without offense to others, purify herself in the broad waters of this great bay without thereby disturbing or annoying any existing interest? Your Commission thinks she may."[8]

Other, and more potent, interests did not. Although they apparently did not resort to rhetoric, and therefore have left us no written record of their argument, the oyster factions prevailed on the mayor and council to reject the Commission's proposal. The local medical community was also involved, although apparently of split opinion, one group arguing that there was no medical risk, the other arguing that pathogens could survive for long periods of time in both salt water and oysters. And finally, there were the objections of a small but well-organized interest group, the night soil contractors who made their living collecting the wastes from vault toilets and selling it to area farmers.[9]

These forces combined to persuade the Mayor and Council to reject the proposal of the Commission. The Mayor, in his 1897 message to the City Council, pointed out that the City had a strong economic stake in the oyster industry, and therefore should not approve a discharge to the Bay.[10] He urged the adoption of "the land filtration technique," an option discussed by the Commission but rejected because of its high cost relative to direct discharge to the Bay. This proposal called for pumping the sewage to the Glen Burnie area in Anne Arundel County, a few miles to the south of the City. There the wastes would be used to irrigate and fertilize farmland, a practice widely used in Europe since about the middle of the century. The Mayor urged prompt action, exclaiming of the project, "it must be done!"[11] The Council agreed to disagree with the Commission, and, in 1898, the Mayor and Council issued a joint resolution rejecting the direct Bay discharge approach.[12]

The Commission obligingly went back to work and issued a second report in 1899.[13] The members, the same as in the 1897 group, clearly had not changed their opinions as to the soundness of their original recommendation, and they spent some time in bolstering the arguments for direct Bay discharge. To their previous list of arguments, they added the observation that much waste from Baltimore reached the Bay anyway: through exchange between the waters of the Patapsco and the Bay; through the disposal form into the Bay of material dredged from the Baltimore harbor (an observation that presages one of the major issues of the 1960's and beyond); and, from runoff from farms that used Baltimore City nightsoil. Furthermore, argued the Commission, if people wanted to worry about the sanitary conditions of oysters, they should worry about oysters harvested from the shallow waters near towns on the tributaries of the Bay. These towns, although not named, surely included Cambridge, Crisfield, and Annapolis, all of which had sizeable waterman populations. With a combination of petulence and stiff-necked pride, they concluded their defense of the dilution approach by saying: "However, if our fellow citizens are not inclined to avail of this the dilution method, the natural and most economical method of disposal, and should determine to have something else, leaving the economies of the dilution method to be enjoyed by our neighbors, . . . nothing remains for your Commission . . . than to point out such other methods as seems to it available, though it be much more costly to construct and operate."[14]

With that final blast, they turned to the alternatives, and recommended that the best approach was to treat the sewage and then discharge to the Bay. Other alternatives combined various treatment strategies and disposal points, as well as the use of Glen Burnie land disposal for at least part of the sewage from the southern portion of the city.[15]

For reasons both political and economical, the City did not act on this second set of recommendations, and it remained for the great Baltimore fire of 1904 to clear the way, both physically and politically, for the construction of a comprehensive sewer system. (By that time, all other major cities in the country had done so. But by being last, Baltimore vaulted into the lead in sewage treatment, as we will describe.) The City government quickly turned to the Maryland General Assembly to get the authorization to form a sewer authority and issue bonds for the construction of a system, an authorization required by the State Constitution. The General Assembly gave its approval, but in so doing stipulated that " . . . said commission, to be formed under the Act, shall have no authority to construct and establish any sewage system involving the discharge of sewage, as distinguished from stormwater or ground drainage, into the Chesapeake Bay or any of its tributaries."[16] The oyster interests, in clear control of the matter through the heavy

representation of tidewater senators and delegates, thus prevented any possibility of the City making use of the Bay for direct discharge.

Faced with this limitation, the newly constituted Commission set about once again to examine the alternatives and come up with a proposal. The first issue was how to interpret the restriction placed on them by the legislature. A strict reading would have suggested that no discharge, treated or untreated, was permitted, but since this was clearly impossible (except through a total land disposal system), the Commission, by resolution, adopted the following approach: " . . . that the effluent proposed to be discharged into the Chesapeake Bay or its tributaries in the system to be recommended by the engineers shall be of the highest practicable degree of purity."[17] (emphasis added) The Commission turned, for the fifth time, to the leading sanitary engineers of the Western world, and with amazing speed and efficiency, in view of the indecisiveness of the previous forty years, adopted a plan to build a sewage treatment plant on Back River. The plant, which was to use sprinkling filters, settling basins, and sand filters, was recognized to be an unprecedented undertaking. Said one of the consultants: "No city in our country of the size of Baltimore has as yet been required to give its sewage treatment with the object of obtaining the highest practicable degree of purity."[18] And, "We are aware that the works proposed at Baltimore constitute by far the largest undertaking of sewage purification in this country." Indeed, when the plant was put into operation in 1912, it was regarded as one of the engineering wonders of the modern world.

In adopting this plan, the Commission was careful to point out that "Owing to the small flow of upland water and the limited range of the tide, there are no strong currents in Back River, and the effluent so discharged would not, under usual conditions, reach its mouth for several weeks. We are of the opinion that there would be no danger from this discharge to the oyster beds of Chesapeake Bay, and no offense along the shores of Back River or elsewhere."[19] The proposal was checked out "with oyster authorities" and, with their approval, proceeded apace.

It is perhaps difficult for the modern reader to appreciate the unprecedented nature of this commitment to treat the sewage of a major city discharging to an estuary. Not only was it the first major city in America to adopt a waste treatment system, but it did it for a reason far removed from those commonly used to justify, or require, the treatment of sewage. The strongest impetus for sewage treatment was probably where such treatment would help to protect a city's own water supply, as in the case of Chicago, which both discharged its wastes (until the development of the Chicago canal) and drew its drinking water from Lake

Michigan. A second incentive was that a downstream neighbor drew its drinking water from the river used by another to dispose of its wastes. A third was that an acute nuisance condition prevailed, that for some technical or economic reason could not be solved by piping the wastes away from the city. A fourth was that the disposal of wastes was clearly injurious to fish, recreation values, or other resources. None of these reasons applied to the Baltimore situation. Had the wastes been piped raw to the middle of the Bay, no water supplied would have been affected, no nuisance conditions created, and, most probably, no major change to the aquatic life of the Bay induced. Yet, it was because there was a possibility that pathogenic bacteria might find their way from a diseased human being to the Bay thence to an oyster, and finally to another human being, that Baltimore spent an enormous amount of money to treat its wastes, before discharging them into a sluggish tidal tributary of the Bay. As we will discuss, it was not until the late 1930's for Washington, and the 1950's for Norfolk, that the other two Bay metropolitan areas put sewage treatment plants on line.

This story is a useful paradigm. It demonstrates the importance of the oyster as the key Bay resource. It illustrates that it is often political influence, not technical evidence, that determines the outcome of an issue. It is the first of many Bay controversies where the technical questions are fundamentally insoluable: because it is impossible to demonstrate that a proposed activity will not have an adverse effect, the only available proof is to go ahead with the proposal and observe its effect. Those opposing the change rely primarily on the argument that an adverse effect is possible, and that it is not worth the risk to find out whether indeed such a possibility is realized. Finally, it illustrates that it is perhaps public opinion that is the controlling "fact" in a given issue. The ultimate concern of the oyster interests was not that oysters would be killed or that people would get sick from eating contaminated oysters. It was that people would associate oysters from the Bay with sewage from Baltimore, make the connection to the recently established and highly publicized link between oysters and sewage-borne disease, and then stop buying Maryland oysters. What was controlling was whether <u>people would think</u> that oysters from the Bay were tainted.

The Baltimore sewer story is interesting also because it gives a well documented picture of the process by which the City officials or, more particularly, their study commissions and consultants, went about developing their recommendations. The commission reports of 1897, 1899, 1905, and 1906 reflect a remarkably efficient, flexible, and sophisticated approach to the problems at hand. They should probably be required reading for anyone, professional, citizen, or politician, involved in contemporary sewage treatment controversies, such as the

perennial debates involving sewage collection and treatment in the Washington metropolitan area. They are useful models of how to bring together the best available technical assistance, evaluate the recognized alternatives, reach a reasoned conclusion, and present a written report, all in a relatively short period of time.

Finally, this story illustrates the serial nature of environmental problems. The sewer issue began with the adoption of a public water system for the city. This system is developed in order to supply pure drinking water, but also for the broader purpose of improving municipal sanitation and safety through the provision of water for street cleaning and fire fighting. But, the increased water supply, together with the adoption of the water closet (flush toilet), more frequent bathing, and other amenities of indoor plumbing, all of which can be seen in one context as environmental advances, created the major problems of contaminated water to dispose of. The first approach of the city was simply to move the wastes downstream (i.e., out into the middle of the Bay). This ran into a competing interest involving another human health issue, so a compromise solution was adopted. As we shall see, that "solution" created other problems, most specifically for Back River, where the discharge from the Baltimore sewage treatment plant has been viewed by many as a source of major degradation to the river. The environmental linkages that became so much a part of the environmental understanding of the 1970's, were well established and demonstrated by this issue that ran from about 1860 to 1912.

Oyster Sanitation in Virginia

While Maryland was going through the resolution of a major water quality issue in the form of the Baltimore sewerage controversy, Virginia was affected in a more insidious way by the aftermath of the Wesleyan incident. The first effect was that local boards of health in the Hampton Roads area began to question the safety of, and then closed to harvesting, some of the leased oyster beds in the shallow creeks tributary to the James River and the Bay. Although the number and extent of these closings are unknown to us, they appear to have been relatively small but highly valuable. Official reaction from the Board of Fisheries was to sneer at those who were agitating for closure of the beds. "We cannot command language strong enough to denounce the action of some 'pure food' faddists. The scare of 'polluted oysters' has cost the workers in Virginia not less than one million dollars a year for 3 or 4 years," said the Board in its annual report of 1910.[20] By 1914, it was stating that the waters of Virginia were almost entirely clean, but that because of adverse publicity, the industry was being hurt. Here, as in Maryland, the concern appeared in the early days to be almost entirely about public opinion. The Board pointed out that it was difficult for a Bay native to realize

that "inlanders" were indeed worried about oyster purity because of the "scare journalism" they were exposed to.[21]

The next year, the Commission's tone changed appreciably. Although still labeling it "The Pollution Scare" in its annual report, it was feeling the direct effect of the market place, and it suggested action. "While the polluted area is small . . . so great is its value, and so damaging its existence to the entire industry because of adverse publicity, that we deem it advisable to recommend to the General Assembly the consideration of legislation which will result in the removal of the cause of the pollution. This can be done by the towns installing sewage disposal plants."[22] This rather indirect statement of inclination, if not intent, at least shifted the problem from the "faddists" to the pollution. No doubt the Commissioners were aware of the sizeable investment made by Baltimore to treat its wastes. They were at least willing to suggest that it be considered as well in Virginia.

The Commission also quoted, with approval, several more emphatic statements about the need to address the source of pollution in tidal waters. Dr. Hugh S. Cumming, a surgeon with the newly formed United States Public Health Service, whose extensive surveys on the Bay area are discussed below, wrote to the Chairman of the Commission: "It is now recognized that no community has the right to dispose of sewage in such a way as to throw unreasonable burdens upon other communities."[23] Although this seems at first inspection to be a simple restatement of a long-established common law principle, it was cited by the Commission as a symptom that times were changing. After giving passing mention to the fact that Maryland had, in 1914, given its Board of Health authority to require municipalities to install sewage treatment plants, the Commission quoted from a paper submitted by a Connecticut official before the National Association of Shellfish Commissioners in 1914: "The contamination of tidal waters . . . is an evil that ought to be stopped." "It is a crime against nature, and it is the more indefensible because it is committed, not by savages or . . . or . . . [nationalities deleted], but by a highly cultured people."[24] Clearly the Commissioners did not wish to speak with such rhetorical passion themselves, but they were at least trying to make a point.

At the same time, the private oyster interests, in the persons of S. J. Watson and Frank W. Darling, sought legal remedies. Watson held a private oyster lease for some 11 acres of bottom in Hampton Creek, within the City limits of Hampton. In 1909, he was informed by county health officers that the waters were "too polluted to permit the sale of oysters therefrom," and in 1914 the state authorities, following a survey by federal health officials, expressly banned the sale of oysters from the creek. (The ban affected other planters in

the area, and it appears that Watson brought suit on behalf of all of them.) Watson thereupon sued the City of Hampton, claiming that its discharge of sewage was unlawful and constituted a trespass against his property, for which he should be compensated. The circuit court ruled in his favor, and awarded him $4,500 in damages.[25]

The case was quickly appealed, and the Supreme Court of Appeals of Virginia reversed the decision on June 8, 1916, in a decision containing a number of interesting statements and principles. The decision hinged on whether the city, in dumping its wastes in tidewater, could be constrained by the private interests held by Watson. The court held that the city was exercising a public function in accordance with state law, and that this function was superior to any rights granted by the state for private oyster culture. It pointed out that the waters and bottoms of the creek, being navigable and tidal, were "owned and controlled by the state for the use and benefit of all the public . . . " It was, therefore, for the state, "through the legislative branch of government, to say how much pollution it will permit to be emptied into and upon its waters, so long as the owners of the land between low-water and high-water mark are not injured . . . "[26] Since the legislature had expressly authorized cities to build sewers for the disposal of wastes, and since it had not required sewage treatment or otherwise restricted the disposal of municipal wastes, the City of Hampton was within its rights and was, therefore, not liable for the damages suffered by Watson.

> Since the state holds its tidal waters and the beds thereof for the benefit of all the public, we are of the opinion that the city of Hampton has the right to use the waters of Hampton Creek for the purpose of carrying off its refuse and sewage to the sea, so long as such use does not constitute a public nuisance . . . The sea is the natural outlet for all the impurities flowing from the land, and the public health demands that our large and rapidly growing seacoast cities should not be obstructed in their use of this outlet, except in the public interest. One great natural office of the sea and of all running waters is to carry off and dissipate, by their perpetual motion and currents, the impurities and offscourings of the land.
>
> The state guards the health of its people for the benefit and protection of the public at large and under present sanitary standards sewerage systems for all thickly settled communities have become an imperative necessity, a public right, which is

> superior to the leasing by the state of a few acres of oyster land . . . [27]

In short, the court hammered home the principle that sewage disposal was in the public interest, subject only to standards imposed by the legislature, which governed the use of the tidal waters in the public interest.

Undaunted by the Watson decision, Darling brought suit against Newport News for the pollution of Hampton Roads, in which he held large and valuable oyster leases.[28] This time the circuit court decided for the City, based on Hampton v. Watson, and the Court of Appeals agreed. The court advanced the strong pragmatic argument that pollution was an inevitable consequence of commerce, industry, and large settlements, and that, therefore, the legislature, in providing for private oyster culture, did so on the assumption that the right of riparians to discharge their wastes to the sea was a superior right. The court said:

> The right claimed by the city clearly existed before the enactment of the oyster law cannot be doubted, and the Legislature cannot be presumed to have intended to destroy this ancient and undoubted public right in the absence of a clear and explicit statute indicating such a purpose. We think the more reasonable view of the statute, that established the private oyster program, is that it was not conceived that it would be thought desirable to continue to plant oysters in an area so certain ultimately to be polluted . . . [29]

In other words, use of the waters of the area for oystering is " . . . subject to the ancient right of the riparian owners to drain the harmful refuse of the land into the sea, which is the sewer provided therefore by nature . . . [30] (emphasis added)

Perhaps encouraged by a long and complex dissent written by one of the justices of the Virginia court, Darling proceeded to the U.S. Supreme Court. There, in an opinion handed down on April 28, 1919,[31] Justice Oliver Wendell Holmes made short work of the plaintiff's case, and in sustaining the decision of the state court, added the observation that reflects the prevailing attitudes of the times, as well as the law:

> The ocean hitherto has been treated as open to the discharge of sewage from the cities upon its shores. Whatever science may accomplish in the future we are not aware that it yet has discovered any generally accepted way of avoiding the practical necessity of so using the great

natural purifying basin.[32]

Ignoring the experience of Baltimore or of numerous European cities in the treatment of sewage, Justice Holmes continued:

> But we agree with the court below that when land is let under the water of Hampton Roads, even though let for oyster beds, the lessee must be held to take the risk of pollution of the water. It cannot be supposed that for a dollar an acre, the rent mentioned in the Code, or whatever other sum the plaintiff paid, he acquired a property superior to that risk, or that by the mere making of the lease the State contracted, if it could, against using its legislative power to sanction one of the very most important public uses of water already partly polluted, and in the vicinity of half a dozen cities and towns to which that water obviously furnished the natural place of discharge.[33]

These cases, beyond laying the claims of the private oyster lessees to rest, established two things. First, waste placement was considered to be an important beneficial use of water, a concept that may seem jarring today, but is explicitly stated in much Bay literature and popular writings at least up through the 1950's. Second, the courts made it clear that it was within the power of the Virginia legislature to require a reduction in pollution, but that it had not done so.

Litigation out of the way, the situation in Virginia stabilized, so that by 1923 the Commissioners of Fisheries could say, "As yet Virginia has no serious question of other pollution on its oyster beds, due to the vastness of our waters and no cities of large population within our confines."[34] The pollution problem they were most worried about was oil. The "oyster scare" had become a reality for the private planters whose beds were affected, but Virginia had neither seen fit to legislate to restrict waste discharge, or to invest in municipal treatment plants.

The Federal Presence

During this period Congress was promoting major changes in conservation and public health. Along with the formation of the Public Health Service (1912), the Congress authorized the conduct of studies on the pollution of navigable waters. This led to an extensive survey of the Bay by Surgeon Cumming, who described the sanitary condition of the Bay in a report remarkable for its scope and detail.[35] The report confirmed the commonly held notion that bacterial contamination was largely confined to the waters immediately in the vicinity of populated

areas, with the most confined and slowly circulating waters presenting the greatest risk of contamination of shellfish. Cumming, working with health officials in both states, identified a number of specific situations that posed a threat to human health. Many of these dealt with the actual handling of oysters once harvested, and with the practice of "drinking" oysters, which involved placing them in fresh or near-fresh water to plump them for the market (a practice which sometimes exposed the oysters to polluted water). The federal presence was, therefore, primarily of a technical assistance and advisory nature, although the pure food and drugs act of 1906 and subsequent acts gave the federal health officials authority to intervene in cases that involved the interstate shipment of contaminated foodstuffs.

The Public Health Service was also called upon to perform a sanitary survey of the Potomac estuary, which it did in 1913-1914. The oyster interests on the Potomac, representing both Virginia and Maryland, were concerned that the sewage from the growing population of Washington, which in 1913 numbered approximately 320,000, would have an adverse impact on the purity of Potomac oysters. The survey concluded that there was no immediate risk to the oysters, since their upper limit was far removed from the Washington sewer outfall, and the net downstream transport of polluted water was slow, allowing adequate time for dilution and oxidation of the wastes.[36] Thus, the Potomac estuary was spared the problem that was faced in the Baltimore and Hampton Roads areas in the early part of the century.

The Illinois Incident and its Aftermath

The stability of the oyster sanitation issue, which is expressed by the 1923 statement of the Virginia Commission of Fisheries quoted above, was shattered by a major outbreak of typhoid in Chicago in November and December of 1924, as well as lesser but significant outbreaks in Washington and New York. In all, about 1500 cases were reported, resulting in 150 deaths. Most of these cases were traced to contaminated oysters, which caused the State of Illinois to impose an immediate ban on the importing of raw oysters. The resulting publicity brought the Bay oyster industry virtually to a standstill.[37]

The Bay states, as well as the other oyster-producing states in the nation, quickly joined with the Public Health Service to establish a program of oyster sanitation that would restore confidence in the purity of oysters. The approach involved the formal adoption of bacterial standards for oyster growing waters, as well as standards and practices for the handling and processing of oysters from harvest to the market place. The system, which relies on the Federal Public Health Service to certify as to the adequacy of state programs, is still in use today.

Each state responded quickly to the problem. In Maryland, there was an immediate move to close beds in polluted areas, upgrade the sanitation practices of harvesters and packers, and convince the Illinois authorities that the Maryland oyster was indeed safe. To that end, the Director of Public Health for Illinois, Dr. I. D. Rawlings, was brought to Maryland, where he personally conducted an extensive survey of Maryland oyster waters and processing plants. He found that, with a few exceptions, the waters of the State were clean, and that a set of specific practices should be adopted by harvesters, shuckers, and packers, to insure that oysters would not be contaminated once harvested. So diligent were the Maryland officials that by October of 1925, the Commissioner of Conservation was able to report to the Governor that the State could certify its oyster safe to the State of Illinois, and "that confidence was returning to the industry."[38]

At the same time, beds in suspect or contaminated areas near Cambridge, Crisfield, Salisbury, and Annapolis were closed, and a campaign was launched to eliminate or improve toilets, privies, and pipes that were discharging sewage to tidewater. After a couple of years of effort, the total restricted area was reduced from several thousand acres to 1288 by January 1, 1928, more than half of which were in the Severn River, near Annapolis. Clearly Maryland had weathered the crisis, and was able to shift its attention back to the perennial issue of whether to expand the private culture of oysters, an issue that preoccupied state officials and members of the General Assembly throughout the first half of the century.

Stimulated at least in part by the oyster sanitation issue, Maryland also launched a sizeable campaign to build sewage treatment plants in its tidewater towns. By 1934, it claimed (for the whole state) that 68% of the population was served by sewerage, and that the sewage of 57% received some form of treatment, "a record not surpassed by that of any other state in the United States."[39] In that year alone, $4.4 million was spent on sanitary projects, most funded by aid from the U.S. Emergency Public Works and Civil Works Administrations, two depression-era sources of assistance.

Virginia also moved quickly in response to the Illinois incident, but its problem and its solutions were markedly different from those of Maryland. Because the center of the Virginia oyster industry was so close to its largest tidewater metropolitan area, the stricter sanitation standards adopted in 1925 resulted in the closing of a much larger area than in Maryland, where, it may be remembered, the largest concentration of people, in Baltimore, were many miles removed from productive oyster grounds, and the sewage of that city had been undergoing treatment for over a decade. Virginia closed 8.3 thousand acres in 1925, 16 thousand more in 1926, and 13.7 more in 1927. By

1933, a total of 38 thousand acres were "condemned," of which approximately 12,000 were considered to be productive.

Although Virginia launched a campaign to eliminate problems in non-sewered areas, it was clear that its primary problem was the result of untreated sewage discharged by the municipalities, military installations, and other government facilities of the Norfolk-Hampton-Newport News area. Thus, the problem was solvable only through the installation of sewage treatment plants, a program that had to gather additional political support and economic feasibility before it was finally undertaken after World War II. But, although there was little concrete action in Virginia, there was a great deal of talk, much of it of considerable historical interest.

As might be expected from previous quotes, the Fisheries Commission apparently confined itself to lamenting the state of things that caused the closing of " . . . the greatest oyster producing territory that ever existed or will exist in the whole world." Although there were, no doubt, unrecorded efforts to address the situation, the commission appeared resigned in 1929, when it said, "It [the Commission] never expects to see Norfolk and Portsmouth provide sewer [sic] disposal plants for the relief of the shellfish industry. These cities may do it in years to come for health conditions and sanitary improvements along their waterfronts."[41] In other words, the cities were acting (or failing to act) and the oyster industry could not muster sufficient clout in the legislature to cause them to do otherwise. The next year, when the bed closings reached 30,000 acres, the Commission's apparent passivity matched its concern. "This is a problem so great that it staggers the best thoughts and energies that can be employed . . . "[42]

The General Assembly did, however, address the issue when it appointed a commission to study the pollution of tidal waters. This group, known as the Spatley Commission, reported to the General Assembly in 1928, but no direct statement of its findings or recommendations was located during this study. Whatever its findings, however, the General Assembly took no action, except that in 1930 it authorized the City of Newport News to issue bonds to construct a sewer and, if the city so chose, a sewage disposal plant, to prevent the pollution of Salter's Creek, the body of water that received most of the wastes from Newport News when Darling sued the city in 1918. The city chose not to build a treatment plant, but proceeded with plans to build a new sewer outfall in Hampton Roads some 2,000 feet from the low water mark, to replace the main city discharge into Salter's Creek proper. In effect, the city was adopting the dilution strategy, by proposing to move its outfall into a body having a large volume of water and substantial currents to disburse the wastes.[43]

At this point, the executive branch, in the person of the Attorney General, acting on behalf of the Governor, sued the city, requesting the court to require the city to install a modern sewage treatment plant, eliminate its discharge to Salter's Creek, and abandon its plan to discharge untreated sewage into Hampton Roads. That made the suit extraordinary in that, in effect, the executive branch was suing the General Assembly for failing to exercise its responsibility for protecting the public interest in tidal waters, specifically the rights of public fishing and the right to water clear enough for recreational use. In its brief, the Executive Branch claimed:

> The General Assembly is the department of the government to which the administration of this property (the tidal waters and bottoms of the state) is committed, but the state as such is the trustee; and no alienation or disposition thereof by the General Assembly is legal which does not recognize and is not an execution of the trust upon which it is held for the people, nor is any use thereof by sufferance of the General Assembly legal which substantially impairs the common rights of fishery or other common rights of the people therein. It is the duty of the General Assembly to make proper provision for the protection and enforcement of the common rights of the people in the tidal waters. But if it authorizes, permits, or suffers an individual or municipality to use the tidal waters . . . in such a way as to destroy or substantially impair . . . the right of the people . . . it is the duty of the executive department of the state government to invoke the aid of the judicial department to restrain the individual or municipality from so doing.[44]

In a lengthy and fascinating opinion, the Virginia Supreme Court upheld the decision of the Circuit Court of Richmond, which had dismissed the suit (i.e., decided for the city). The court basically found that the concept of public trust, as argued by the Attorney General, did not apply.[45]

The reasoning behind this opinion runs to nearly 10,000 words, and explores some dark and dusty corners of constitutional law, but in sum the court concluded: the right of fishery was something that the General Assembly could restrict or impair, so long as such action was in the public interest; the discharge of untreated wastes into tidal waters, following the arguments of Darling and Watson, was a public beneficial use of long standing; and the General Assembly, by expressly giving Newport News the authority to build a sewer to discharge into

Hampton Roads, while neither expressly nor impliedly requiring treatment, "must be construed as authorizing Newport News to discharge its sewage into the Roads untreated." In short, the benefits of waste disposal and fishery are equal in status, and the restrictions and limitations to be placed on these several uses are questions committed by the Constitution to the discretion of the legislature free from the control or interference of either the executive or judicial department of the government.[46] Clearly the fisheries interests, both public and private, would have to fight and win their battle in the General Assembly. With closures of oyster beds to reach 60,000 acres by 1934, they must have wished for some of the political clout of their fellow watermen in Maryland, where the oyster interests had forced Baltimore to treat its sewage on the mere suggestion that it might hurt the Maryland industry.

In 1934, the legislature once again received a report from a pollution study commission, which had been appointed by the governor at the request of the General Assembly "to study . . . the most practical and economic methods of controlling the pollution of [Virginia] waters." The commission submitted a brief and pointed report, in which it urged the creation of a "Commission of purification of waters," to be given powers to prohibit pollution, float bonds for the construction of sewage treatment facilities, and approve discharges.[47] The commission was emphatic in its position. "No language used in this report in describing the existing conditions need be considered as too strong. It is, therefore, urged and insisted that the most careful consideration be given to the conditions outlined herein."[48] In outlining the problem, the commission addressed not only the threat to the fisheries industry, but warned that bathing beaches were forced to close, "property values and tourism destroyed, health threatened, and terrible economic waste created."[49]

The passion of the majority of the commission was more than matched by the unanswered logic of a dissenting member of the commission, a Mr. J. C. Biggins, who wrote an opinion equally as long as the majority, and apparently to more effect because the legislature again took no action. His argument could serve as a model for anyone wishing to oppose public investment in waste treatment, because it contained just about every imaginable argument. He first asserted that the public cost would be very high, and that there was no guarantee that the situation would be much improved, in that there were numerous sources of pollution for which there was no feasible control. He cited as an example the situation in Baltimore, where, despite investments of over $20 million, one could still not swim or fish in Baltimore Harbor. Furthermore, even if substantial improvements could be made, there was a question of whether it would be in the economic interests of the area. Expensive requirements for waste treatment might put the port at a competitive disadvantage

relative to more liberal (i.e., permissive) areas. Would it not make more sense, he argued, to recognize a de facto situation and zone the Hampton Roads area for commerce and industry, thereby excluding any claims against these activities by other users (except, presumably, matters pertaining directly to human health or common law nuisance)?[50]

No doubt the issues were further debated, both in the legislature and without, but of direct evidence of that discussion we found none. In 1938, however, more than 30 years after the "oyster scare" first surfaced, the Virginia legislature created the Hampton Roads Sanitary District, giving this regional body authority to raise money, construct and operate sewage treatment facilities and sewerage systems, and control pollution in the Hampton Roads area.[51] The work of the District was largely interrupted by the war, so that its activities are to be discussed in the next section dealing with the period 1945 to 1960.

Industrial Pollution

Although oyster sanitation and domestic sewage disposal were the dominant water quality issues of this period, there was a continuing concern for industrial pollution in the Bay area. In general, these concerns are less dramatic and less well-documented than the great oyster issue. Involvement of government with industrial wastes was scattered both in time and space, reflecting the fact that industries themselves were widely dispersed and were relatively small. As industries grew in size and complexity, and as they tended to become more concentrated, they came to be seen as more of a problem, and thereby drew the attention of government. It was not until after World War II, however, that industrial pollution took on its modern role as a major villain (whether justified or not). In the period at hand, industry was cast in the role of a bit player, which occasionally showed its potential for stardom, but did not gain notoriety until the end of the period. As with the oyster story, we will follow these appearances in each of the two Bay states.

The term "industrial wastes," is a broad and inclusive one. Industries range in the character of their wastes from tomato skins from a canning factory to the complex man-made chemicals from a plastics manufacturing plant. For this period we will also apply the term to the oil pollution caused by ships using the Bay. Given this range, however, three things stand out about the problems associated with industry: first, oil was seen initially as the major problem for the Bay proper; second, food processing plants were by far the most numerous and most noticeable sources of industrial problems; and, third, the problems other than oil tended to be associated with free-flowing streams or restricted tidal waters, rather than with the Bay itself, although there are some notable exceptions that

will be discussed. In general, the 1980 popular image of a giant industrial complex hovering over the Bay, with huge pipes spewing forth wastes, is inappropriate to this period. More likely, the industry was a small building employing a few people, and the wastes were shoveled or dumped by hand. In most cases, the wastes were not exotic and lethal; they were mostly familiar, if unsavory things like slaughterhouse offal, brewery mash, milk by-products, or chicken scraps.

Through the nineteenth century, as we have described, there was mounting concern for the decline of certain kinds of fish in the Bay and its tributaries. At the turn of the century, the Maryland Commissioners of Fisheries laid the blame squarely on industry, the first such public utterance that we have found. "We also desire to express our opinion in this report as to the enforcement of local and state laws prohibiting the pollution of streams with chemicals, refuse from canning houses, sawdust, and other stuff injurious to the maintenance of good fishing in our rivers, either by anglers or net fishermen. Complaints have been pouring in upon us for a year or more that the refuse from tomato canning establishments dumped into several rivers were ruining the fishing, and the falling off in the catch dates with the location of the canneries on the river banks."[52] Since this was a period in which truck farming and canning were at their peak in Maryland, the problems were both relatively new and intense. The Commissioners also commented on the restricted or reduced runs of shad, a topic of concern in both Bay states since about 1830, and identified pollution as one of the probable causes. Surgeon Cumming, in his 1914-1916 survey of the Bay, also made note of canning wastes, and quoted an early State Health Department report that described the foulness of the Cambridge Harbor during canning season. "Such a siltation is indefensible and should be tolerated no longer by the citizens of the city," it said.[53]

Despite this expression of concern, nothing tangible was done by the state until 1914, when the Health Department was given authority to control wastes from industries when their discharges constituted a threat to human health or a nuisance.[54] This somewhat restricted authority was followed in 1917 by a statute that gave the Conservation Commission the authority over discharges that were injurious to fish and other aquatic life.[55] This statute, which appears to have been sometimes vigorously implemented, and sometimes virtually ignored, gave the State, in the words of one official, "powers for undertaking the great work of making the waters of the State fertile for the growth of fish and shellfish life."[56]

The Conservation Department and the Health Department jointly addressed the industrial problems in the twenties and thirties, and by the late 1930's were joined by another important participant, Chesapeake Biological Laboratory at Solomon's

Island. The style of dealing with the problems can be characterized as one of cooperation and persuasion, reflected by a statement of the Conservation Department made in 1922. After outlining the nature and scope of the problem, it said: "The Commission does not in any way desire to put any restraint or additional hardship by way of expenditures upon the local capital invested [in industrial plants], but it is necessary that the rivers and streams which empty into the Bay should be cleaned of pollution . . . where pollution is found, there will be an endeavor on the part of the Commission to solicit the cooperation of the industry concerned to stop the pollution. By this method we believe pollution can be curbed to a large extent."[57]

In the same annual report, there was a discussion of the state of the art of industrial waste management. The National Association of Fisheries Commissioners had been studying the problem for years, and were recommending an emphasis on reclamation or recycling. The Health Department pursued this approach with considerable vigor, as reflected in its annual reports of the same period. A Baltimore Sun feature article in 1930 described the progress being made in Curtis Bay, a largely industrial area south of Baltimore. It described a number of specific cases where the Health Department had worked with industries and had suggested ways in which changing processes would both reduce pollution and save money.[58]

Curtis Bay continued to be a focal point of Maryland attention in the 1930's. Frequent fish kills and complaints from area residents kept government officials and industries searching for causes and solutions. One of the more intractable problems was a large paint pigments firm, which produced a highly acidic discharge. The Health Department worked with the company to develop a new process by which the wastes could be reduced. The planned changeover required, as a temporary measure, the discharge of the wastes directly to the Bay. The Health Department agreed with the opinion of the consulting engineers working for the firm, that the discharge would have no adverse effect on oysters and other aquatic life. The Conservation Department, however, was not persuaded, and "declined permission" for the project.[59]

This situation, which was eventually resolved to everyone's satisfaction by the adoption of a new process, reflected two most interesting aspects of the Maryland approach to industrial wastes during this period. First, it is clear from this episode, as well as others like it, that state officials had a powerful influence on industrial activities. While statutory authority was limited and the staff small, state officials were directly involved in approving or modifying industrial discharges. This was a far more activist program than appears to have been appreciated by later students of the Bay, particularly

in the 1960's and 1970's. It appears that the primary limitations on the program were the limited scientific and technical capabilities then available to study specific problems, rather than any fundamental limit in statutory authority or official concern.

Second, there runs throughout the interplay between the Health Department and the Conservation Department two somewhat contrasting approaches to problems, which will be seen again in later periods and discussed in the concluding sections of this report. The Health Department took what for simplicity might be known as an engineering view, while the Conservation Department took a biological view of the issues at hand. The former tended to be more pragmatic and empirical, stressing doing what was feasible and then seeing what the results were, while the latter tended to be conservative, stresses potential damage due to little-understood or unknown chemical-biological relations. This contrast, which admittedly requires some interpretation to isolate from the limited documentation of the time, becomes one of the dominant issues regarding the Bay in the late 1960's.

Industrial wastes from food processing plants proved to be generally less amenable to correction by the techniques developed by the Maryland official team. In many cases, there simply were not effective and economical techniques available for dealing with a particular waste. In others, the small size of the operation, and its marginal economic status, and, in the case of canneries, its seasonal nature made it difficult to require installation of an effective waste disposal system. As a consequence, distilleries, canneries, and milk processing plants were each identified, at different times, as the major water pollution problem facing the state.

By the late 1930's, however, there was a general note of optimism and progress among Maryland resource officials. With the revival of industrial activity following economic improvement in the mid-1930's, the Conservation Department found that it had more complaints to investigate. Far from being concerned, the Commission used this fact as an occasion to report: "The Department has been very diligent, and in investigating these complaints, have notified the owners of these industries that the pollution must cease. The Department is glad to note that in every instance, the officers of the corporations readily cooperated with the Department, and in some instances, have gone to considerable expense to see that no refuse from their factories would, in any way, pollute or destroy the fish life in the waters of the State. The Department feels that they have been successful in protecting the State's waters."[60] A few years later the long-time State Game Commissioner Lee LeCompte spoke of the great progress that had been made in eliminating industrial pollution, calling it " . . . the near extinction of a major nuisance."[61]

And the Health Department, in its reports, stated of activities in the Curtis Bay area, which had received the most concentrated attention in the State: "The officials of the industrial plants in the area and the Conservation Commission are to be commended for their splendid cooperation." And of industries generally, "It has been gratifying to note the recent interest, displayed by manufacturing officials generally, in the matter of stream pollution."[62]

In 1936, the statutory authority of the Conservation Department was used in court, apparently for the first and only time, resulting in the levying of a $900 fine against the Owings Mills Distillery, Inc., for the release of caustic soda into Jones Falls.[63] The case was hailed as a landmark, because it demonstrated the legal backing available should an industry prove recalcitrant. However, the prevailing effort as expressed throughout the period was to resolve industrial pollution problems through cooperation. Speaking generally, but clearly with the Maryland experience in mind, Dr. Abel Wolman summed up this approach as follows:

> If any specific feature has been responsible for progress [in water quality control] in many of the states, it has been the existence of one or more informed officials who have had sufficient energy and wisdom to carry the program forward by cooperative activity with industry and municipality. Only rarely in such progressive areas has it been necessary to invoke the law.[64]

By the onset of World War II, the Maryland program of control of industrial effluents and the building of municipal sewage treatment plants was a source of pride. It was the opinion of many that it was a national leader in the field, and it may indeed have been. Certainly, there was a great deal of effective activity by a very small staff, and 25 years had seen the establishment of legal basis for action followed by a program that involved the Health Department, the Conservation agencies, and the research establishment in a cooperative routine.

By the end of the period in 1945, the operating question was, "Given the successes of the Maryland program, was it enough?" A number of symptoms appear in the record to suggest that the answer was no, an answer that was arrived at officially in 1947, as we shall see in the next section. Perhaps the most poignant concern was expressed by R. V. Truitt, the long-term director of the Chesapeake Biological Laboratory. CBL has been doing pollution-related studies in the Curtis Bay and Baltimore Harbor areas since the early thirties, and by the latter part of the decade was looked to by the conservation agencies as the majcr source of expert information. Consistently,

Dr. Truitt and others at the lab had pointed out the assimilative capacity of the waters of the area were great, and that there was no evidence that industrial wastes were having an adverse effect on economically important resources. In making this statement in 1940, Dr. Truitt stated: " . . . more extensive study is planned on the problem of possible accumulative effect of continued discharges of wastes upon the delicate biological balance of Bay waters and the relationship of these changes to conservation."[65] (emphasis added) Here is sounded, perhaps for the first time, the warning that has been so much a part of the ongoing debate about the quality of the Bay since the late 1960's. The CBL scientists were aware of the large quantities of wastes being discharged to the Bay in the Baltimore area, and while they were also aware of the tremendous assimilative capacity of the receiving waters, they also wondered whether other things were going on that might have gone undetected.

Various groups of citizens were concerned about other more palpable issues. Through the first half of the 1940's, a number of incidents and conditions occurred or pertained that raised questions as to the adequacy of the State's program for industrial and municipal pollution control. The residents of Curtis Bay and Back River, in particular, were not persuaded that progress was being made. Newspaper accounts during that period speak of fish kills, nuisance conditions, and generally unacceptable conditions, and it can be inferred from the degree of official attention to these areas that the level of complaints was relatively high.[66] A 1942 fish kill in Curtis Bay resulted in the official explanation that it was part of a broader fish kill that was probably not related to any man-induced condition. In the same period, the Health Department pointed out that the unpleasant conditions in Back River were due, not to industrial pollution, but to "profuse growth of algae due to high organic content of the effluent from the Back River STP." And the Baltimore Inner Harbor had once again achieved notoriety as a seriously polluted body of water.[67]

More generally, indeed state-wide, the conservation and sportsman's groups were starting to aggregate for more effective action against industries. In 1935, forty-four conservation organizations and other groups united to form the Maryland Outdoor Life Federation.[68] The federation promptly began to lobby for a change in the organizational structure of the conservation agencies of the state, and also for the establishment of a Board of Pollution Control. In 1938, a committee on Bay pollution was formed, that pushed for greater recognition of potential and real problems faced by the Bay due to the growth of population and industry. The Isaac Walton League, representing fishermen for the most part, kept pressure on for the protection of freshwater streams, and they were quick to use fish kills in the Bay or tangible instances of industrial

pollution as evidence that a greater level of control was needed. Although the war years tended to reduce the intensity of this pressure, it was there ready to reassert itself after the war.

Virginia's experience with industrial pollution differed in several important respects from that of Maryland. The differences, although expressed in the legal and bureaucratic framework of the time, had their origins in the differing geography and varying emphasis on the uses to which the Bay was put. Virginia did not have the industrial concentrations that Maryland had in Curtis Bay, Baltimore Harbor, and Sparrows Point. On the other hand, it appears to have had a greater problem with industrial pollution of inland streams, than did Maryland, so its attention was largely in that direction. Its rapid growth as a shipping area and Navy port raised oil and dredged spoil as issues of more prominence than in Maryland. And its reaction to the deterioration of streams due to pollution was of long standing, but was inexorably tied to other issues such as overfishing, stream blockage due to dams, and land run-off.

The Virginia record concerning industrial pollution during the period 1900-1945 is not as extensive or clearcut as that of Maryland. Virginia did not have the industrial concentrations similar to those in Curtis Bay or Baltimore Harbor. Perhaps partly for that reason, it did not establish a clear legislative framework for action, as did the Maryland statutes of 1914 and 1917. Virginia's concerns during that time were apparently more directed to industrial pollution of inland streams. Nevertheless, there were a number of specific developments in Virginia during this period that concerned industrial pollution, and many of them are important as precursors of the major Bay pollution issues of the last two decades. Virginia's experience during this time is therefore no less interesting than Maryland's, even if somewhat briefer.

Virginia officials had long been concerned over the decline of shad and other anadromous fish in her rivers. These declines were attributed to various factors, including dams, overfishing, and agricultural practices, but there was also recognition that industrial wastes were blocking the passage of fish. Numerous laws were enacted during the nineteenth century to prohibit the discharge of various polluting substances into the streams of the states. For the most part, the language specifies free-flowing streams, but it is clear that one of the major concerns was the effects of wastes on anadromous fish from the Bay (and ocean) as well as concern for resident inland fish. These statutes were enforceable primarily by the local law enforcement officials; no bureaucracy was established to implement or oversee them. Characteristically, they show more concern for the deliberate poisoning or killing of fish, than for the unintentional effects of industrial wastes, although both categories

are covered.[69]

In the first part of the century, the wastes from a pulp mill in Richmond drew attention, and resulted in an extensive study of the situation, which recommended a combination of civil common law remedies and new legislation to alleviate what were considered to be unacceptable nuisance conditions.[70] The concerns that prompted this study were primarily those of residents along the banks of the river, rather than for the fish life in the river. Nonetheless, this study, which resulted in no definite action, represents the first investigation of tidewater industrial pollution located during the course of the present study.

With the marked increase in shipping in the lower Bay, the problem of oil from ships came into prominence and for a number of years was seen as the most serious pollution problem in the Bay. The oil came from the practice of ships pumping ballast water from their bilges as they entered the Bay to take on cargo. The problem in the lower Bay was aggravated by the presence of a large number of Navy ships, and also because the ships heading for Baltimore would begin to pump their bilges as soon as they entered the protected waters of the Bay from the open ocean.[71]

The concern was felt by resort and property owners along the shores of the lower Bay, as the many fine beaches of that area were occasionally fouled by oil. But it was the Commissioners of Fisheries who expressed the strongest opposition to this practice. Although their attention had been directed to the oyster sanitation issue for some years, in 1919 they were to say: "One of the greatest questions for the future is that of pollution. The pollution by sewage of our ever increasing population and the waste from our rapidly growing industries is affecting the entire fish and oyster industry in and around Hampton Roads, but of all the destruction caused by pollution that from oil waste is the worst."[72] (emphasis added) They pointed out that oil, unlike sewage, affects not only the mature oysters themselves, smothering them or making them unpalatable, but it also interferes with the plankton that is the food for oysters, and directly kills oyster spat when it is part of the plankton (plankton are floating plant and animal organisms that are largely incapable of motion; oyster spat larvae are part of this plankton until they settle and attach to some hard surface on the bottom).

Thus the Commission, in a statement remarkably similar to the broad environmental concerns of the late 1960's, pinpointed a clear enemy for the organisms of the Bay. This concern was shared by the other Eastern states, including Maryland, and their combined action led to the passage of the Federal Oil Pollution Act of 1924.[73]

How effective this act was is not discernable from the records we examined, but its passage coincided with the "Illinois incident" which quickly vaulted oyster sanitation ahead of oil as a major concern. The Fisheries Commission, after commenting on it for a number of years, gave it no mention in its annual reports thereafter. However, it received mention in a 1935 report by the Virginia Planning Board as a significant problem, and was still a major issue in Maryland following World War II. For this period, however, it was an issue that both states conceded was the responsibility of the federal government. It therefore marks the first instance of a direct regulatory role by the Federal government in a water quality issue of the Bay. This modest beginning, of course, gives no clue as to the major growth of federal involvement that took place in the latter part of the 1960's.

In 1930, there was a massive die-off of oysters in the York River, beginning a controversy regarding the effects of industrial wastes that persists to this day. A large pulp mill at West Point was suspected of being the cause of the die-off.[74] Government officials in Virginia and their representatives in Washington sought the aid of the U.S. Bureau of Fisheries, which established a laboratory at Yorktown "solely for the investigation of industrial pollution in the York River."[75] The study was carried on for most of the next decade, and although there was a steady decline in oyster productivity in the area, and the pulp mill wastes were "definitely implicated," there was no government action taken to abate the wastes while the scientists sought to determine the specific causal agents of the decline. Government at the state and federal levels apparently felt it necessary to prove that there was a direct link between the discharge and the observed declines, before requiring remedial action. Such proof was not forthcoming.

What did emerge from the study was the recognition that the state needed a research capability to address the kinds of questions raised by the York Pulp Mill, as well as to address the broader questions of management of Bay species. After the Federal government pulled out of its York River studies, the State of Virginia and the College of William and Mary established the Virginia Fisheries Laboratory at Yorktown, with Curtis L. Newcombe as its director. The laboratory took up from the Marine Biological Laboratory the task it had adopted in its last years, which was " . . . to find ways and means for improving the tidewater fisheries resources of Virginia . . ."[76] Thus, while the oyster die-off on the York remained perplexing, the trade wastes of the pulp mill led chronologically, if somewhat tangentially, to the state laboratory, later renamed the Virginia Institute of Marine Science, that was to play a major role in pollution issues after the War.

Virginia also faced an industrial issue in the late

thirties and early forties, the resolution of which freed her from difficulties that were later experienced by Maryland. The issue was dredged spoil disposal, a perennial matter of concern on the Bay. The approach channels of Hampton Roads and the port areas required periodic dredging, both to remove accumulated sediment and to increase the size and depth. Prior to the thirties the practice in the lower Bay had been to dispose of the dredged material overboard in the shallow areas of the Bay, where it would be distributed by the currents and eventually settle out. Watermen and property owners began to object to this, claiming that it caused adverse effects either through mechanical smothering or it transferred polluted bottom sediments from the harbor area to the open Bay, where it would contaminate oysters and foul beaches.[77]

In 1940, the Congress directed the U.S. Army Corps of Engineers to study the situation and develop a solution. The Corps came back in 1944 with a proposal to dike a large area on the south side of the James River just to the west of the Elizabeth River opposite Norfolk. The diked area would receive the dredged spoil from all the public and private navigation projects in the area. At a public hearing on the project in 1944, some nearby oyster leasees objected that the effluent from the spillways draining the project would pollute their beds. On the basis of this, the Corps required that the state cancel the nearby oyster leases, and hold the Federal government harmless for any damages done to oyster grounds in the vicinity. The project was approved by Congress in 1946, and built between 1954-1957.[78]

By so resolving the issue of dredged spoil disposal, Virginia interests were able to eliminate it as an important issue thereafter, thus avoiding one of the most vexing and time-consuming controversies that faced state and federal officials in Maryland from the early 1960's to the present.

The Bay as a System

This period, from 1900 to 1945, marked some important shifts in the perspective of Bay officials and scientists with respect to the biology and management of the Bay. During this period both states established Bay laboratories to conduct research on water quality and Bay management issues. These laboratories, along with the Chesapeake Bay Institute, established shortly after World War II with the sponsorship of both states, became the focal points for studies that attempted to understand the Bay as a biological and physical unit, transcending political boundaries or the functional boundaries of interest groups.

The scientific perspective of the Bay as a unified but open system was addressed in a variety of ways. One of the most

interesting statements, with considerable relevance today, was made by a Canadian scientists who reviewed the work done at Solomons up to the early 1940's.[79] A. G. Huntsman suggested that the Bay was an extremely complex and open system, and that long and careful study would be necessary before it could be managed intelligently as a unit. In the meantime, however, it would be necessary to have " . . . investigators prepared to brave the criticisms of the academic theorists . . . These investigators should not hesitate to draw preliminary conclusions from limited facts . . . "[80] In other words, although science was going to progress slowly in unraveling the secrets of the Bay, the needs of management for scientific guidance would not wait, and therefore there needed to be courageous "directed research."

Huntsman also stressed the openness of the Bay system. He discussed the influence of land drainage from the large watershed area draining to the Bay, and pointed out that much of what went into the Bay started its journey from well outside the tidewater area. He also reminded his readers of the ocean connection, saying: "The Bay is very far from being a discrete productive unit, since there is said to be extensive movement of the fishes out from and back into the Bay."[81] Of man's activities, Huntsman sounded a rather striking view, and related directly to the controversy then underway with regard to the effects of the York pulp mill effluent: "It is perhaps axiomatic that the changing character of the fisheries of the Bay is determined mainly by changes in the physical chemical conditions of the Bay. But we are prone to think first of man's actions, of the psychology [physiology?] of the fish, and of biological factors, and to overrate the probability of these being responsible for any change in a fishery."[82] In other words, one should respect the fact that the Bay is subject to large naturally occurring changes and that man's influence in relation to these might be relatively small. At about the same time, Dr. Truitt of the CBL was suggesting that the Bay was a delicately balanced system, and that man's activities might be having a subtle cumulative effect.

Bay managers, in 1933, expressed a clear understanding that the Bay had to be considered as a single resource unit, and managed accordingly. In October of that year, an interstate conference on the Bay was held,[83] the first of many conferences to discuss the management of the Bay. The conference proceedings are of interest in that they give a reasonably accurate picture of what was on the minds of the resource managers of the time. Most strikingly, a number of speakers sounded a theme so common today -- that the Bay is a national treasure, that it must be viewed and managed as a single system, that man's activities must be carefully monitored and controlled, and that some sort of interstate body should be established to deal with the management and protection of the Bay. Although

by no means all speakers addressed these issues, they were stated enough to suggest that such ideas were no means rare or radical.

The concept of the Bay as a system was thus well established by the 1930's, both in the minds of managers and scientists. It remained for a later period to take direct governmental action on the basis of this concept.

Other Management Issues

This discussion of the Bay, centered as it is on water quality issues, should not obscure the fact that water quality was not the issue of dominant interest and government attention from 1900 to 1945. That prize would have to go to fisheries production and marketing issues, which, although affected by water quality issues, were to a large degree independent of them. This is particularly true in Maryland, where the dominant political issue was that of the management, or alleged mismanagement, of the oyster resources of the Bay.[84] There were, as discussed above, a number of competing interests who fought for legislative and administrative power over control of the oyster rocks and barren grounds of the Bay. The recurrent question was whether private oyster culture should be supported and encouraged in Maryland. This issue, it may be remembered, had been largely settled in Virginia before the beginning of the twentieth century. According to critics of the Maryland approach, the Virginia balance between public and private oyster culture had allowed her to surpass Maryland in productivity, even though her grounds were not as extensive or productive. Since 1884, Maryland fisheries officials had argued that the Bay was a tremendously productive body of water, capable of producing far more oysters than occurred naturally. The institution of oyster farming, following methods developed in France, could make them both commercial and sport species. Maryland, for example, imposed a prohibition on the purse seining of menhaden, arguing that menhaden were the bait fish that attracted large numbers of more desirable predator fish to the upper Bay. Virginia, on the other hand, allowed this efficient method of harvest of menhaden, and a thriving menhaden fishery was established in the lower Bay.[91]

In short, there were numerous issues other than pollution to occupy the time, energy, and political capital of the various Bay interests in both states. While pollution was certainly an important issue, it and its logical successor, the over-all quality of the Bay, was not the dominant issue in the minds of public officials or the public for at least another 15 to 20 years.

By the close of this period, significant advances had been made in the public programs dealing with water quality in the Bay. Each Bay state had established a laboratory to do the

basic and applied research so necessary to the attack on pollution issues. Both states had dealt with municipal sewage, so that a substantial portion of the tidewater population was hooked to a sewage treatment plant. On the industrial front, there had been considerable work, particularly in Maryland, to effect in-plant changes to reduce the effluents to the waters of the Bay, and there had been numerous attempts to address the difficult scientific, technical, and economic problems posed by industrial effluents and their control.

Despite this activity, there was a clear opinion that the situation was growing steadily worse. Growth in population and industrial activity had simply outstripped the activities of the governments of the two states. Whether there was actually less or more wastes reaching the Bay in 1945 than in 1900, our research would not allow us to say. Whatever the facts, there was definitely a growing concern among the citizenry of both states, particularly among sportsmen's groups. Pollution of the Bay, and more specifically of many of its tidal and non-tidal tributaries, was seen as a major and growing problem. The result was the establishment in both states of pollution control agencies, charged with the responsibility to address pollution and its control on a sustained basis. The development of these programs is the major feature of the next section, to which we now turn.

Section V Notes

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62. Department of Health of Maryland "Annual Report, 1937," p. 195.

63. Ibid., p. 197.

64. Quoted in "Water Pollution: A Policy and Program for Control," Maryland Water Pollution Control Commission, Jan. 1949, p. 10.

65. Maryland Conservation Commission "Annual Report, 1940," p. 59.

66. See Water Pollution vertical file, Pratt Memorial Library, Baltimore, Md.

67. Interview, Dr. Corneillius Kruse, Department of Public Health, Johns Hopkins University, Oct. 16, 1980.

68. See articles in the Baltimore Sun, dated May 10, 1936, August 28, 1938, and September 8, 1938.

69. See, e.g., Chapter 61, 1849-1850 Acts of the Assembly; Chapter 147, 1852, Chapter 85, 1874; Chapter 270, 1884.

70. Ernest C. Levy, "Report to the Water Committee on the Investigation of the Effect of Trades Wastes on the Water of the James River at Richmond," Richmond, 1905, p. 21.

71. Maryland Conservation Commission "Annual Report, 1922," Appendix, p. 21.

72. Commissioners of Fisheries of Virginia Annual Report, Fiscal Years 1918-1919, p. 10.

73. See discussions of oil pollution in Maryland Department of Conservation "Annual Report, 1923," pp. 27-31, and 1924.

74. Commissioners of Fisheries of Virginia "Annual Report, Fiscal Year 1930," p. 6.

75. Commissioners of Fisheries of Virginia "Annual Report, Fiscal Years 1938-1939," p. 30.

76. Op. cit., Fiscal Year 1940-1941, p. 12.

77. John B. Pleasants, "The Tidal James: A Review," Special Report No. 18. Virginia Institute of Marine Science, Gloucester Point, 1971, p. 108.

78. "Craney Island Spoil Disposal Area," briefing paper prepared by the Norfolk District, U.S. Army Corps of Engineers, June, 1970.

79. A. G. Huntsman, "Oceanographic Research on Chesapeake Bay," undated.

80. Ibid., p. 22.

81. Ibid., p. 14.

82. Ibid., p. 24.

83. Chesapeake Bay Authority "Conference Report," Oct. 6, 1933, Baltimore, Md.

84. Cf., State Planning Commission, "Conservation Problems in Maryland," Baltimore, 1935.

85. William K. Brooks, et al., "Report of the Oyster Commission of 1884," Baltimore, 1884.

86. Chesapeake Bay Authority, op. cit., p. 121.

87. News article, Baltimore Evening Sun, Jan. 14, 1939.

88. Commissioners of Fisheries of Virginia "Annual Report, Fiscal Years 1938-1939," p. 9.

89. Ibid., p. 8.

90. See news article, Baltimore Sun, Sept. 16, 1941.

91. John Frye, The Men All Singing, Downing Press, Norfolk, Virginia Beach, 1978.

SECTION VI

1945-1960

When the war ended in 1945, Virginia had in place the Hampton Roads Sanitary Commission. It immediately resumed its work to sewer and treat municipal and industrial wastes in this prime Virginia trouble spot on the Bay. By 1947 the Commission had committed $12 million to the task, and improvements to municipal system, actions by industries, and the correction of some of the smaller sources of pollution in restricted waters resulted in the reopening of oyster beds.[1] At the same time, the Virginia Fisheries Laboratory resumed its study of the biology of the Bay, and also turned its attention to exotic pollutants such as DDT.[2] There was clearly a sense of optimism.

The most important development of the period occurred far from the Bay in the vicinity of Front Royal. A plastics plant had been constructed on a branch of the Shenendoah River, and its discharges, begun in 1940, had completely killed off the aquatic life on a sizable stretch of the river. Fishermen and conservation groups in the area were outraged, and they proceeded to seek political support for government action. An influential state delegate from that area, A. Blackman Moore, agreed to serve on a study committee to investigate what needed to be done about water pollution in the state. His committee came forward in 1945 with a recommendation that a state agency be established with responsibility for the management of pollution control throughout the state (excluding the area under the jurisdiction of the Hampton Roads Sanitary District). The bill went before the 1945 session of the General Assembly, and under Moore's protection and influence, passed the House and Senate with only a few dissenting votes. One of the features that allowed for broad acceptance was a grandfather clause that exempted industries and municipalities already in place. Any expansion or modification, however, required regulatory approval by the Water Control Board. The basic approach of the Board, as with many other state agencies of the time, was to deal with the condition of the stream or receiving body of water, not with the discharge itself. This, according to the prevailing dilution theory of the time, allowed for the maximum beneficial use of the water for waste disposal as well as for other uses. The Board therefore had to establish that there was a harm to other uses before taking direct remedial action.[3]

The creation of the WCB, together with the progress of the Hampton Roads Sanitary District, was greeted with enthusiasm by the Marine Resources Commission. In its 1948-1949 report, it said: "The problem of pollution is, we think, a vanishing one . . . . We can envision the time in the not too distant future when pollution will no longer be a problem in Virginia, and valuable oyster ground formerly condemned for use will be restored to production."[4]

The next few years seemed to support that optimism. The treatment plants put on line in the Hampton Roads area allowed for the opening of nearly 12,000 acres of oyster ground, a success that was hailed as a national model.[5] The Water Control Board, using a similar approach in other parts of the state, concentrated on the development of primary treatment plants for municipal systems. Industries were encouraged or pressed to adopt internal process changes to reduce their loadings to tidewater and feeder streams.[6]

Through the fifties, however, the optimism of the Marine Resources Commission eroded. Read in sequence, their biennial comments on the pollution issue sound like a winding-down record. In 1953, they state: "The problem of pollution continues to be a serious one. However, the State Water Control Board is making progress in the abatement of pollution for certain streams and the prevention thereof in others."[7] By 1957, the statement was a bit stronger: "The problem of pollution continues to plague the seafood industry despite the fine work of the State Water Control Board and the Hampton Roads Sanitary District. The discharge of industrial waste . . . poses a real problem."[8] By 1959 it was "[p]ollution is a continuing and rapidly growing serious problem which requires prompt attention . . . " "Rapid growth of population and industry is outstripping the ability of the SWCB and HRSD to deal with the problem."[9] And, by 1961, the Commission lamented: "Contamination of our natural waters by pollutants of various types is one of the most pressing problems facing our Commonwealth today. Pollution is directly affecting our marketing and the consumption of oysters and clams. It is very possible that it may be one of the reasons for our decline in production."[10] This time there was no mention of the otherwise fine effort of its sister agencies.

A number of factors contributed to this decline in confidence. There was a marked growth in industrial activity in the tidewater area, particularly in the Hopewell area of the James River. Moreover, the research work of the Virginia Fisheries Laboratory identified new concerns. The laboratory investigated pollution sites and fish kills in the early 1950's, and reported on the difficulty of establishing a direct link between discharges, such as those from the major pulp mill wastes at Yorktown, and deterioration in the resource. The lab pointed

out the difficulty of doing research in marine environments, when most of the national research upon which standards and pollution control were based had been done on freshwater bodies of water.[11] In its 1956-57 report, it presented a laundry list of things to worry about, while stressing that there was too little knowledge upon which to base sound and enforceable control requirements. It warned of the problems of subtle effects on nursery grounds and spawning areas; of detergents and industrial chemicals that passed through municipal treatment systems unaffected; of toxic insecticides and weed killers that could have major and persistent effects in small considerations; and of new and poorly understood chemicals, the toxic effects of which had not even been guessed at, let alone studied.[12] More generally, it described the need to study and understand the Bay as a system, in order to be able to assess the effects of man's activities. "There must be more research on pollution," the laboratory urged, " . . . before the Tidewater area undergoes an industrial explosion . . . "[13]

One specific problem that drew scientific attention was a massive oyster dieoff in the Rappahanock River in 1955, repeating an earlier dieoff in 1949. Once again the watermen applied common sense and argued that it was caused by upstream pollution. The scientific evidence, much of it gathered and evaluated by the CB Institute, pointed to naturally occurring low oxygen levels brought on by heavy rainfall. In describing the low oxygen conditions found in various parts of the Bay, the VFL stated, "There is no evidence whatsoever that pollution contributes significantly to any of these situations."[14] The director of the CBI, in commenting on the results of its studies, expressed sympathy with the watermen in finding it difficult to accept that the problem was a naturally occurring one, since they had seen other periods of heavy rains in which such a dieoff had not occurred. However, the evidence still did not point to any man-induced changes.[15]

In Maryland, support for a pollution control agency had been developing ever since the late thirties, especially from the conservation and sportsmen's groups. In January of 1945, representatives of the Isaac Walton League and the League of Maryland Sportsmen met wtih the governor and key legislators, to discuss problems pertaining to pollution in free flowing streams. The Health Department was brought into these discussions, but the conservation agencies, which had undergone some reorganization in 1939 and 1941, were not.[16] The Board of Natural Resources formed its own study committee, and joined the private groups in urging the Governor to form a study committee to examine the state program and see what changes, if any, were needed.

By late 1945, a Committee on Water Pollution was formed, and a year later proposed the formation of a Commission similar

to that existing in Michigan. The commission would be a coordinating body which drew together the various functions and interests of the Health Department and the fisheries interests within the Board of Natural Resources.[17]

By the time of the 1947 legislative session, the proposal had changed to that of a new agency, similar in some respects to the Board already in place in Virginia. Sportsmen's groups in particular had argued that a coordinating body would not be sufficient. The need, they felt, was for an agency that would have pollution control as its sole function. Against the objections of municipal and industrial interests, as well as from government officials,[18] the bill passed, and the Water Pollution Control Commission was established.[19]

The work of the commission in the early years is well documented in its annual reports, which reflect the philosophy under which it operated. The commission was pragmatic and modest, stressing the twin principles of cooperation and reasonableness that had guided the work of the Health Department and the Conservation Department in the 1920's and 1930's. The annual reports and other documents assume that waters have a natural assimilative capacity, and that it was only after that capacity had been exceeded that interference with other uses occurs. It was the duty of the Commission to see that such excesses did not occur, and when they did, to take corrective action. Throughout the process, economic reality had to be kept in mind, and requirements had to be " . . . not only technically attainable but also financially feasible, so as not to impose upon the State's industrial and municipal economy an expense which is out of proportion to the benefits sought."[20] The Commission stressed that its work was in the best interests of the economy, pointed out that it was often to the advantage of business to support pollution abatement programs. "An active water pollution control program . . . is a good business policy for the State as a whole," it said.[21] "No one reading the technical journals of industry could fail to be impressed by the sincerity of industrial management in its efforts to solve the problem of stream pollution."[22]

During this period the regulators spoke well of the regulations. With a cooperative spirit, the regulators set out with a small staff to attack water quality problems. These problems were seen to be wastes from canneries, wash from sand and gravel operations, and oil discharges on the Bay. Work on the first two concerned non-tidal streams, although most of the operations were in the coastal plain and therefore had at least an indirect effect on the Bay. The oil issue was attacked primarily by enlisting the aid of Bay pilots, who were urged to impress upon the ships' captains the importance of observing the 1924 Federal Oil Control Act. Although prosecution under the Act was difficult and the fines small, a real hardship could

be placed on a ship by requiring her to remain in port while an investigation was conducted. This tactic apparently helped reduce the incidence of violations, as oil disappeared from the list of primary pollution concern in the Bay.[23]

If progress was the official view expressed in the annual reports of the Water Pollution Control Commission, the Health Department, and the Board of Natural Resources, the newspaper coverage of the time was to the contrary. Curtis Bay and Back River continued to be sources of criticism and complaints. In 1948, over 1500 residents of Back River assembled to protest water quality conditions there, and agitated for the City of Baltimore to do something about the Back River Sewerage Treatment Plant. The City was examining a variety of alternatives to upgrade the plant when a circuit court judge ordered the city in 1949 to consider direct discharge to the Bay as a viable alternative; in so doing he seemed to vindicate the Sewerage Commission of 1899, who had pressed unsuccessfully for this use of the Bay.[24] Industrial discharges continued to be complained about in Curtis Bay, and in 1955 Anne Arundel County took the unusual step of suing the DuPont Company to enjoin it from building a discharge pipe in Chesapeake Bay, although such a measure had the approval of WPCC.[25]

In the mid-1950's, numerous communities in the Upper Bay were still discharging raw sewage to the Bay, prompting the formation of the Upper Chesapeake Watershed Association, a citizen's group whose primary mission was to create pressure for the construction of waste treatment plants. Also in 1955, the first major Bay water pollution news article appeared in the Baltimore Sun, itemizing the various problem areas, the sources of pollution, and the lack of treatment implemented by either municipalities or industry.[26] The article suggested that the WPCC was something less than aggressive in having taken only four industries to court in the eight years of its existence. Also during the same time (mid-1950's), the municipalities of the Bay area were complaining that the Health Department was being unreasonable in its demands that they install modern sewage treatment facilities. The towns simply could not afford it, they claimed.[27] These complaints, which co-existed with those of citizens and conservation groups, that not enough was being done, suggest that there was considerable ambivalence about the State's programs that did not get expressed in any dramatic political way.

Throughout the period, new water quality concerns were added to the long-standing issues of municipal and industrial discharges. Wastes from boats became an issue that received mention in the late 1940's, particularly in the crowded and poorly circulating subsidiaries of the upper Western shores, such as the South, the Severn, and the Magothy in Anne Arundel County, and the Back and Middle Rivers in Baltimore.[28] Growing

awareness of pollution as an issue was matched by rapidly growing use of the Bay for recreation. Indeed, they formed a tight causal cycle, as the very boaters and residential shoreline owners who were expressing concern about pollution were also seen as a source of the problem.

Another new issue was the use of the Bay for explosives testing. Although not specifically a water quality issue, the testing of explosives created a number of highly visible fish kills, roiled water, and general nuisance that was complained about by citizens and worried about by scientists and managers. The official view was that the military activity was of localized effect, and did not constitute a major threat to the Bay; nonetheless, it was so extensive and so prominent that it came to be seen in some circles as a major menance that significantly interfered with the productivity and enjoyment of the Bay.[29]

Acid mine wastes was also a new concern of the 1950's. Coal mining in the upper reaches of the Potomac and Susquehanna had created hundreds of miles of highly acidic and biologically dead streams, a condition that got much more attention after the war with the growth in sport fishing and the increased political activities of sportsmen's clubs. While the acidic waters were, for the most part, buffered by the time they reached the Bay, there was a popular suspicion that the evil-looking "yellow boy" of mountain streams would eventually work its way to the Bay.

In 1954, the U.S. Bureau of Mines developed a plan that would have brought mine wastes directly to the Bay. In what is probably the biggest of the "big pipe" proposals for waste disposal in or to the Bay, the Bureau proposed that a 180 inch pipe be built from the anthracite coal region of northeastern Pennsylvania to the Bay, in order to drain the underground coal mines that were rapidly filling with water.[30] The water could not have been pumped into nearby streams because of its high acidity, but the Bureau argued that the Bay, with its enormous quantity of water, would quickly neutralize the acids of the mine drainage, and suffer no harmful effects.

Maryland officials responded with outrage. After assuring watermen and sportsmen's groups that the State of Maryland would not tolerate such an invasion from a neighboring state, the Governor himself held meetings with the Congressional delegation and with officials in the Interior Department to seek to get the project withdrawn.[31] The alacrity of the response was perhaps unnecessary, as it appeared that the proposal had serious technical and economic flaws. Pennsylvania officials were not themselves enthusiastic about the project, so that by the end of the year it had died. Nonetheless, it is a project of considerable interest because it reflects another example of the attractiveness of the Bay as a sink for wastes, and it

represents one of the first clear examples of an interstate water quality issue.

A second "big pipe" proposal marked this decade, this one with a source closer to the Bay. Consulting engineers working for the District of Columbia proposed that the municipal wastes from that city, which contained a substantial loading from the Maryland suburbs, be piped across southern Maryland and discharged into the main stem of the Bay. This would remove pressure from the highly restricted and slowly circulating Potomac River estuary, and would provide a source of irrigation water to Southern Maryland farmers, then experiencing a rather severe drought. In addition, suggested the consultants, the wastes would provide additional enrichment to the Bay, which would be beneficial to the total productivity of the Bay and not injure any of the Bay's resources.[32]

Section VI Notes

1. Commissioners of Fisheries of Virginia, Annual Report, Fiscal Years 1946-1947, p. 9.

2. Commissioners of Fisheries of Virginia, Annual Report, Fiscal Years 1948-1949, p. 30.

3. This account of the origins of the State Water Control Board was given in a private interview by A. H. Paessler, long-time Executive Secretary to the Board. Richmond, Virginia, December 1980.

4. Commissioners of Fisheries of Virginia, Annual Report, Fiscal Years 1948-1949, p. 10.

5. Water Resources Policy Committee, "A Water Policy for the American People," Vol. I, 1950. GPO, Washington, D.C., p. 187.

6. A. H. Paessler, ibid.

7. Commissioners of Fisheries of Virginia, Annual Report, Fiscal Years 1952-1953, p. 10.

8. Ibid., Fiscal Years 1956-1957, p. 10.

9. Ibid., Fiscal Years 1958-1959, p. 11.

10. Ibid., Fiscal Years 1960-1961, p. 12.

11. Ibid., Fiscal Years 1956-1957, p. 49.

12. Ibid., Fiscal Years 1956-1957, pp. 49-51.

13. Ibid., Fiscal Years 1960-1961, p. 46.

14. Ibid., Fiscal Years 1958-1959, p. 32.

15. Ibid., Fiscal Years 1958-1959, pp. 51-52.

16. Maryland Board of Natural Resources, Annual Report, 1945, p. 76.

17. Ibid., 1947 Report, p. 143.

18. See Baltimore Sun articles of November 27, 1945; March 16, 1946; and October 3, 1946, for discussions of the development of the Act.

19. Annotated Code of Maryland, Article 66C, Sections 34-45, 1951 (Flack).

20. Maryland Water Pollution Control Commission, Annual Report, 1947, p. 9.

21. Maryland Water Pollution Control Commission, Biennial Report, 1952-1953, p. 9.

22. Maryland Water Pollution Control Commission, Biennial Report, 1950-1951, p. 25.

23. Dr. Joseph McLain (first chairman of the Water Pollution Control Commission), private interview, September 1980, Chestertown, Maryland.

24. Department of the Health of Maryland, Annual Report, 1949, pp. 40-41.

25. Baltimore Sun, June 19, 1957.

26. Baltimore Sun, "Maryland Pollution," March 6, 1955.

27. See Baltimore Sun, March 12, 1955; and November 29, 1956.

28. Department of Health of Maryland, Annual Report, 1949, Baltimore, p. 49.

29. See Maryland Board of Natural Resources, Annual Report, 1947, 1959, and 1961.

30. Baltimore Sun, March 1, 1954.

31. Washington Post, November 1, 1957.

32. Abel Wolman, John C. Geyer, and E. E. Pyatt, A Clean Potomac River in the Washington Metropolitan Area, Interstate Commission on the Potomac River Basin, Washington, D.C., 1957, pp. 49-50.

SECTION VII

1960-1972

Clustered around 1960 are a number of events that presaged fundamental changes in the kinds of issues that concerned Bay governments. Virtually all of the previous concerns were prompted by episodes where municipal and industrial wastes at various locations attracted the attention of scientists, administrators, legislators, and the courts. After 1960 concerns became larger. The concept of water quality became all inclusive; governments more and more asked the question: "What is the condition of Chesapeake Bay?" The Bay became generally recognized as an ecological system, subject to a wide variety of man-made influences transcending the boundaries of states, the jurisdictions of agencies, and the capacities of science to define and predict.

Some issues of the 1960's had been around for some time; others were new. But all were marked by problems of increased size, complexity, and persistence. Flow regulation or modification of the major rivers (Susquehanna, Potomac, and James), as a tool in water quality management, came under consideration. The effects of waste heat discharges, particularly from power plants, began to be seen as the major threat to the Bay. Spoil disposal in the Maryland portion of the Bay developed into a full-blown controversy. Over-enrichment of the Bay and heads of the major sub-estuaries became a matter of concern. The effects of navigation projects on salinity first on the James and then on the old C & D Canal became a point of debate. And large scale engineering projects raised the question of cumulative effects of all of man's activity. Rapid development in the Washington suburbs and its effect on sewage disposal and soil erosion, introduced land use practices as a source of concern.

Tying all of these issues together were a series of journalistic accounts of the Bay and its problems. These articles, both news and feature, began in the early 1960's and reached a peak of volume and urgency around the end of the study in the early 1970's. To the detailing of these issues we now turn.

In the early 1960's, the programs of the two state water pollution control agencies continued substantially as before. In Virginia, the general feeling was that significant progress had been made on the municipal wastes front, that there was a

reduction in oil pollution, and that it was now time to work more directly with industries to reduce wastes through the construction of waste treatment facilities. Previously, industries had been urged to adopt internal process changes that would reduce their discharges.[1] In Maryland, programs continued to stress the need for cooperation with industry in setting realistic goals and providing economically feasible solutions. Toward that end, the Maryland Commission began a series of annual conferences to discuss waste control technologies.[2]

Nonetheless, there were signs that the rapid population growth throughout the region was making the existing programs inadequate. The Virginia Fisheries Commission, true to form, continued to express concern for the effects of pollution, while praising or at least encouraging the Water Control Board and the Hampton Roads Sanitary Commission. "Contamination of our natural waters by pollutants of various types is one of the most pressing problems facing our Commonwealth today," it said in 1961.[3] And through the decade, while varying its primary concern from industrial to municipal pollution, it was consistent in the opinion that the problem was grave. In 1971, it repeated its 1961 refrain, "contamination of our natural waters by primary and secondary pollution is one of the major problems confronting the seafood industry . . . our paramount concern at the present is the problem of municipal sewage."[4] Treatment plants generally were not able to handle storm loads, and, as a consequence, beds were frequently closed for some time following rains. And in 1972:

> We know that the Water Control Board is working diligently to prevent contamination of our waters, but this is a gigantic task . . . . The Commission prays to the General Assembly to hear the plea of an endangered industry and to act with courage and decisiveness in providing the impetus for swift corrective action in this area.[5]

In Maryland, the fisheries industry was optimistic. The areas closed to shellfish were considerably smaller than in Virginia, and the MSX disease that had greatly reduced oyster stocks in Virginia, had had little effect in Maryland. The 1960's also marked a time of rapid increase in Maryland oyster harvest, due to an aggressive state-sponsored reseeding program, and several years of above-average natural reproduction. Thus, Maryland was able to recapture first place in national oyster production, a spot it had relinquished to Virginia in 1930.[6]

Maryland was also successful in upgrading its municipal waste treatment plants, so that by 1969 it claimed that approximately 80% of the Bay area sewage received secondary treatment.[7] And on the industrial front, there was a consistent sense of progress in the reports of the WPCC (renamed and reorganized as

the Department of Water Resources in 1964), where the number of orders for compliance, investigations, court actions, and other measures of activity continued to increase.[8] These official reports are less than convincing, however, since they give only a numerical report on activity, and do not reflect the volumes of wastes or the actual conditions of the receiving waters.

1964 brought a significant change in the federal role in water quality control, with the passage of the FWPC Act of 1964. This act required that the states establish water quality standards for all interstate waters within their borders, in order to qualify for federal assistance in waste treatment financing, and to avoid direct federal enforcement intervention. Both Maryland and Virginia developed programs of compliance and, in the process, underwent rapid growth in their water control staffs and budgets. The direct impact of this administrative and regulatory change on the Bay is difficult to discern, but it is noteworthy that the shift to water quality standards did not produce a record by which net progress could be measured (despite the emphasis on the quality of the receiving water rather than on control of discharges). The only available benchmark for achievement of conventional water quality objectives (i.e., control of discharges from industries and municipal sewer systems), appears to be in the summary comments of the numerous journalistic discussions of Bay water quality during this period, which will be discussed below.

In the early 1960's, two Corps of Engineers' proposals for major public works projects on the James River introduced salinity modification as a "water quality" issue and prompted scientific study and political controversy. The first was a river basin program for the entire river, issued in 1962.[9] The multi-purpose program, consisting primarily of a system of dams, would have allowed for the partial control of freshwater flows into the estuary, thus affecting salinity. The second project proposed the deepening of the shipping channel to Richmond from 25 to 35 feet.[10] Because salinity distribution in the Bay and its tributaries is affected by the size and depth of the channels, this project also suggested that a change in salinity would occur.

Salinity had long been a matter of concern to Virginia oystermen. At the low end of the range of the oyster, an unusual rise in freshwater inflow will depress salinity and result in stress or death to oysters. This was often experienced on the Potomac, and to a lesser extent on the other major Virginia rivers. Generally of more concern, however, were the higher salinities, because numerous pests of oysters were more prevalent in the higher salinities. Other things being equal, it was desirable to keep maximum salinities low, especially in the vital seed-producing portion of the James. The invasion of MSX in the late 1950's, which had hit the Virginia oyster

industry so hard, underscored this relation. MSX was generally limited to higher salinity waters.[11]

In considering these two Corps projects, then, Virginia officials and watermen attempted to assess the impact of the proposals on the viability of the oyster industry. This concern, of course, was nothing new. What was novel was the fact that they were now dealing with a fundamental parameter of the natural system, salinity, rather than with a relatively small quantity of a constituent added by man. The concern had enlarged from pollution to basic ecology. Obviously, significant changes in the salinity of the James could have substantial effects on the entire biological system supported by the estuary. The question was, what were desirable and what were undesirable changes.

The evaluation of the proposed river basin plan led to a generally favorable response from the tidewater interests. The basic result of the program would have been to even out the flow of the river over the course of the year. This would prevent summer salinities from going too high in the lower estuary, thus holding the high-salinity predators at bay. It would also reduce the heavy slugs of flood waters, which tended to limit oyster production in the upper part of the estuary. Two related water quality benefits were expected. Increased summer flows would provide more dilution waters for the wastes entering the river at Richmond. This would tend to lessen the degree of pollution downstream in the freshwater portion of the estuary. Second, the reduction in floodwaters would also reduce the oxygen-depleting effects of storms, which had been held accountable for heavy oyster mortalities in the Rappahanock River in the previous decade.

The proposed shipping channel was quite another matter. Largely through the careful work of the Chesapeake Bay Institute, it was understood that the James River, as well as the Bay and the other major tributaries, had a two-layered circulation pattern, with a net upstream flow of dense high-salinity water in the lower part of the water column, and a net seaward flow of fresher less dense water above. Deepening and widening the channel, it was reasoned, might increase the total volume of seawater movement upstream, resulting in higher salinities, and also physically aid the upstream movement of oyster predators. The fisheries interests, faced with a further threat to their depleted industry, vigorously opposed the project.[12]

After the couple of years of jockeying between the fisheries and port interests, a positive approach to resolving the conflict was adopted. The Virginia General Assembly appropriated $400,000 in 1964 for the construction of a hydraulic model of the lower James estuary. The model was to test the effects of the construction of the navigation channel on salinity

distributions. The model was quickly constructed at the Corps of Engineers waterways experiment station in Vicksburg, Mississippi. Using Corps experience in calibrating and testing such a model, together with inputs from the Bay scientific community, it was determined that the channel would have virtuallly no effect on the prevailing salinity regimen of the estuary. On the basis of that finding, the Governor was authorized by the General Assembly to give consent to the project.[13]

What had been a major standoff between competing interests was resolved using the best technology available to make an informed judgment as to the effects of the project. It stands as a landmark of rationality and objectivity in Bay resource management decision-making. Regrettably, from the standpoint of completeness, the navigation project was never begun. During the time that the project was in doubt, an oil pipeline was built between Hampton and Richmond. Since oil was one of the commodities that gave the project its economic viability, the provision of an alternative transportation mode changed the picture. Upon reevaluation the Corps found the project to be only marginally in the black (with a benefit/cost ratio of barely over one) and so the project was withdrawn. It should be noted that there were other environmental problems associated with the project, which would have become more prominent had it been pursued. Chief among them was the problem of spoil disposal, which had long vexed Maryland officials. Since that problem came to a head in Maryland at about the same time that the James River controversy was underway, we will now turn to it.

Navigation channels and facilities in and around Baltimore Harbor had required frequent dredging since the early part of the nineteenth century. The Patapsco River, unlike Hampton Roads, was not a natural deepwater port, and the Patapsco, although not a large river, received the erosion from a 400 square mile watershed, most of it hilly and highly erodable, and thus contributed much more silt to the harbor than did the small and slow flowing rivers of the Hampton Roads area.

In the nineteenth century, most of the material dredged from the channels was simply transported to a nearby area and dumped overboard. From the beginning, this practice bothered oystermen, who claimed that it smothered their beds. On the other hand, port authorities complained that oystermen damaged the channels by dredging for oysters along their edges. Such, apparently, was the nineteenth century standoff on the issue.[14]

With the expansion of the port and approach channels in the 1950's, the Corps of Engineers began to dispose of spoil in the Kent Island Deep, an area of deep water that lay to the east of the main channel near the Bay Bridge. This practice was strongly objected to by Kent Island residents and watermen, and

it gradually became a matter of increasing concern to fisheries biologists and managers.

In 1959, after years of receiving complaints on the issue, Governor Tawes appointed a committee to study the matter. Although the primary concern was the biological effects of spoil disposal, there were arguments from Kent Island property owners that the filling of the Kent Island deep was changing the currents along the shoreline and greatly increasing the rate of shore erosion. They also claimed that the water along the shoreline was made more turbid by the dumping. Both of these claims were considered farfetched by scientists, but they added to the political pressure to do something about the activity.

The Committee reported in 1961, recommending the formation of a permanent commission to review all disposal questions and other issues involving the use of state submerged lands. It also recommended that the state adopt a policy of land disposal of spoil where possible. "The deep waters of the Bay remain an important ecological environment which should remain free from encroachment whenever possible."16 The Governor promptly formed a Submerged Lands Commission, made up of various state natural resources and economic development interests, and chaired by the State Comptroller.

In the mid-1960's, the spoil disposal issues raised by the expansion of the Chesapeake and Delaware Canal took center stage away from the Kent Island Deep issue. The Canal, which was being widened from 250 to 450 feet, and deepened from 27 to 35 feet, produced an enormous quantity of dredged spoil. Much of that taken from the canal proper was disposed on land, but the dredging in the approach channels was pumped to nearby shallow areas and to the Pooles Island Deep. The concern of the Maryland fisheries officials was that this would damage the spawning and nursery areas for a number of important finfish, principally the striped bass, and might also put further stress on the salinity-limited oyster beds in the upper Bay, which had been on the decline since 1881.

Significant attention was given to this issue by both the Submerged Lands Commission and the Board of Natural Resources. For a time it was proposed that all dredged spoil be placed on marshlands on Aberdeen Proving ground. By the mid-1960's, the competing state interests had reached a compromise that would allow for some disposal on land and some in Poole's Island Deep. The Corps of Engineers, however, would not accept the additional costs involved in such a practice, so eventually the state resources agencies had to back down before the pressure from the port development interests, and the overboard disposal continued for both the C & D and the Baltimore Harbor projects.[17]

In the meantime, a number of studies were conducted that

tended to diminish concern that the dredging and spoil disposal was having a pronounced adverse effect. The primary result of these studies, aside from advancing knowledge of the biology of the upper Bay, was to provide guidelines for the timing of dredging and spoil disposal, so not to interfere with spring spawning of striped bass. These guidelines were adopted and the spoil issue appeared for a time to be a problem solved by debate and compromise, and by the application of applied scientific research.

In 1968, however, an additional element entered the spoil disposal picture. Research had been going on for about a decade on the uptake of heavy metals by shellfish. For a shorter time, detailed studies were being made of the water quality and sediments of Baltimore Harbor. In 1968, the Submerged Lands Commission was officially informed of the problems posed by the high concentrations of heavy metals found there.[18] To dispose of these sediments in the open Bay would raise the possibility that shellfish would concentrate these metals to the point that they would pose a threat to human health. At that time, there was substantial uncertainty as to the actual risk involved. Little was known about the actual physical, chemical, and biological routes by which heavy metals might find their way into shellfish. Furthermore, there was little agreement as to the levels of metals that should be tolerated from a human health standpoint.

Despite these uncertainties, the need for action was politically clear. Here was once again a threat to the oyster industry, if not in the direct form of a biological menace, at least in the form of a public relations problem that might affect the marketing of oysters, whether contaminated or not. The state moved quickly to develop a solution. Following a consultant's study, the Submerged Lands Commission proposed the construction of a contained spoil disposal area to receive contaminated spoil from Baltimore Harbor. A number of possible sites were considered; the one found most economical and feasible called for the construction of a gigantic man-made island in the vicinity of Hart-Miller Islands just to the northeast of the harbor entrance. (This is the same island pair over which the Baltimore Sewerage Commission proposed to build the Baltimore sewer outfall in the 1890's.) The original plan called for the island to be approximately two miles long, half a mile wide, and 25 feet above mean water, with a total capacity of 125,000,000 cubic yards. The plan received the approval of the state resource agencies, the Port Authority, and the Corps of Engineers, all of whom were represented on the Submerged Lands Commission, and the proposal was formally adopted by the Governor and submitted to the General Assembly in February of 1969. "Confined disposal of certain types of dredging spoil is essential to the preservation of the environmental integrity of Chesapeake Bay. Provision of the contained disposal area

will assure the continued orderly development of water-oriented industry of the State without jeopardizing water quality for at least the next twenty years."[19] The General Assembly quickly approved a bond issue for $13 million to construct the disposal area, and the detailed engineering studies for the project were begun.[20]

With a solution to the contaminated spoil disposal problem in the offing, Maryland resources agencies argued for the suspension of harbor dredging until the Hart-Miller project was completed. Commenting on a Corps of Engineers project in the fall of 1970, the Deputy Secretary of the Department of Natural Resources recommended disapproval, "Since the confined disposal area for the Upper Bay should be in operation by the time this dredging project is to be initiated [in the winter of 1971-72]." The director of the Fish and Wildlife Administration likewise recommended disapproval of a Maryland Port Authority project in Dundalk in 1971, citing the risk that overboard disposal in the upper Bay would pose to a "developing commercial product, the freshwater clam Rangia cuneata." Federal fish and wildlife and water-quality officials also became involved in the process, since all dredging projects needed a certification that they would not contravene existing water quality standards or federal guidelines. What resulted was a series of negotiated compromises that allowed limited dredging while the details of the Hart-Miller proposal were developed, and while the biological questions relating to contaminated spoil were further studied.[21]

The more significant controversy was not between resource and port development officials, or between state and federal levels of authority. The Hart-Miller project, which had been so carefully worked out between competing interests at the state level, and which was seen by the state resource officials as a major environmental victory for protecting the quality of the Bay, was effectively stalled by determined local opposition. Residents of the two peninsulas of land to the west of Hart-Miller Island found the prospect of a large new landmass objectionable. The reasons for the opposition range from objections to destruction of the small natural islands to the claims that the man-made island would change the circulation patterns of Back and Middle Rivers, and do irreparable damage to the ecology and recreational values of the entire area. Residents objected to the change to the landscape, to the possibility that the disposal area would smell, that it would pollute groundwater, and that birds using it would sicken and die from exposure to the contaminated wastes. They claimed initially that the island would eventually be used as an industrial park, which would further degrade the area, a claim that prompted the state to give assurances that the island would eventually become a state park.[22] At the state wetlands hearing in the spring of 1971, several hundred residents turned out to express their opposition to the project, often jeering the numerous state offficials that

testified on behalf of the project. With the state giving quick approval to the project, the opponents turned their attention to the federal approval process, where it was effectively stalled. Joined by boaters and fishermen who use the existing islands and nearby waters for recreation, they launched a campaign of opposition that stalled the proposal some ten years after the project was to have been constructed.[23] The various legal and political maneuvers used in blocking the project are complex and, for the most part, fall outside the time boundaries of this report.

The Hart-Miller controversy is of special interest in this narrative because it represents perhaps the most significant water quality issue in the history of the Bay (at least up to 1972), when viewed from the standpoint of its economic impact. Yet, its basis, stemming from concerns for the marketability of Bay oysters, was largely a matter of conjecture. There was, in 1965 or 1970, no evidence that there was an actual health risk. There was certainly no modern equivalent of the Wesleyan incident, that prompted the blocking the earlier Hart-Miller project. Nonetheless, the enlargement of the Baltimore Harbor facilities has been effectively stymied over this issue. There is now even a body of scientific opinion that suggests that it would be safer to use deep-water overboard disposal of contaminated spoil, rather than a contained area, since the material would be returned to the environment in which it had been stable for some time, in which there would be little biological activity, and in which it would not be exposed to oxygen and the leaching effect of rainfall, as it would be in a contained area.

If spoil disposal in the upper Bay has been the issue involving the longest conflict between competing Bay uses, the use of the Bay for power plant cooling water was perhaps the issue that developed the most intense controversy. Starting with a coal-fired power plant at Chalk Point on the Patuxent River, then another conventional plant at Morgantown on the Potomac, and a nuclear plant on the James River in Virginia, the issue culminated with the Calvert Cliffs nuclear power plant on the main stem of the Bay in Maryland. The issue neatly spans the period under consideration, beginning in 1960 and peaking, if not ending, in late 1971.

Maryland officials had first become concerned about the question of the biological effects of cooling water discharges while reviewing the proposed power plant on the free-flowing portion of the Potomac at Dickerson. There was an emerging body of literature which recognized that elevated temperatures could alter river biota. When the Chalk Point plant proposal was received in early 1961, a new set of questions were raised because of the estuarine character of the river. The Water Pollution Control Commission therefore established a research program to be conducted by the Natural Resources Institute, a

research and teaching arm of the University of Maryland created that year out of the Department of Research and Education, which was abolished. The major component of NRI was the Chesapeake Biological Laboratory at Solomons.

Basically the concerns of the Maryland officials were threefold. First was the effects of the exposure to high heat on organisms taken into the power plant condensers. Second was the effect of the chlorination that was necessary to keep the condensers free of algae and other fouling organisms. Third, and most important, was the effect of the heated water discharge on the ecology of the estuary in that area. Since the plant involved a substantial temperature rise, and used a relatively large portion of the available water for cooling, it was at least possible that the plant would have a major and possibly adverse effect on aquatic life.

The research progressed over a number of years, first involving the collection of background information, then making comparative studies once the plant went into operation. As the results were completed, a generally unfavorable picture began to emerge. The NRI scientists implicated the plant in a number of adverse conditions they observed, most notably a large crab dieoff in 1964, a dieoff of finfish the same year, and an increased incidence of "green" oysters in the vicinity of the plant which they attributed to copper coming from the plant's condenser tubes.[24]

The conclusions of NRI were generally challenged by officials in the Department of Chesapeake Bay Affairs, who felt the issue of green oysters was exaggerated and threatened to raise a new issue of concern in the minds of the consuming public. Scientists hired by the power company put forward reports that argued that the plant had had little adverse effect. The Department of Water Resources generally accepted the research of the power company, and even later suggested that the objectivity of the NRI group and its work was subject to question.[25] And scientists at the Chesapeake Bay Institute, who were also conducting research on power plant discharges, generally felt that the effects of Chalk Point plant were minor and, for the most part, temporary. VIMS scientists, on the other hand, were generally disposed to take the same view as the NRI scientists, that the power plants posed substantial risks to the Bay environment.

This variance of professional and scientific opinion might have been of little long-term account, had it been restricted to Chalk Point. In fact, however, the results of NRI's work there was being released and discussed in the press during the same period in which Maryland was also evaluating a power plant proposal at Morgantown, when a nuclear power plant was under construction on the James, and when Baltimore Gas and Electric

Company announced its intention to build a nuclear power plant on the Bay at Calvert Cliffs. In a very short span of time, thermal "pollution" became a major new issue, and the basic disagreements over Chalk Point became very much expanded at Morgantown and Calvert Cliffs.

The exact sequence of events relating to the three power plants is now virtually impossible to sort out, particularly since much of the early consideration of the thermal issue went unrecorded. However, the principal initiator of the public controversy was the announcement by Baltimore Gas and Electric in May of 1967 that it intended to build a massive nuclear power plant on Chesapeake Bay. Many different interests opposed this proposal. First there was a concern for the cliffs themselves, since the proposed plant was at the site of extraordinary fossil deposits from the Miocene period. Second were the concerns of property owners in the vicinity of the plants, particularly those whose properties would be traversed by the transmission lines carrying the electricity to the Baltimore area. Third were those who were opposed to nuclear power, because of concern for the risks of radiation, nuclear waste disposal, or accident. And, finally, there were those who concentrated on the possible effects of the waste heat discharged to the Bay.

Although all these concerns received considerable attention, and perhaps the land use issue generated the most active opposition, it was the thermal question that received the most attention from officials and the press. By early 1969, enough public concern had been generated to result in six bills being introduced in the General Assembly regarding power plants on Chesapeake Bay, including one that would impose a five year moratorium until a study could be conducted on the effects of waste heat discharges.[26] None of the bills passed, but opposition to Calvert Cliffs continued to grow.

In the meantime, the Department of Water Resources had granted a permit for the operation of Morgantown, an issue that had been under study for over two years. Primarily because of the controversy over Calvert Cliffs, and fed by the reports of NRI from its Chalk Point studies, the Morgantown action also drew heavy fire, some of it from the Virginia side of the river.

Prompted by these objections, the direction of the CBI, Dr. Donald Pritchard, issued a statement in which he appraised the likely effects of Morgantown on the Potomac. His reasons for doing so were explicit:

> The considerable newspaper coverage of statements concerning possible excessive damage to the Chesapeak Bay and its tributary estuaries from thermal effects of electric power plants now under construction or planned, and the expression of concern over

> the members of the State legislature, has led to the general public impression that the Chesapeake Bay and its tributary estuaries are in imminent danger of catastrophic damage to commercial fisheries, sport fisheries, recreation and other uses. It is my first opinion that such is not the case . . . In my opinion, the public as well as their elected representatives have been misled as to the scope of the problem, and the degree to which existing knowledge can be utilized in appraising the problem . . . A number of scientists and psuedo-scientists in this state have been quoted, and misquoted, as predicting severe damage from thermal pollution. Those of us who have contrary views have so far remained publicly silent. I find it necessary to break this silence.[27]

He then went on to appraise the Morgantown project in the light of the NRI findings on Chalk Point, and in the process levied a direct criticism on the findings of its research and the conclusions drawn from them. In a cover letter to a state senator, he summarized his opinion on the NRI work:

> I am of the firm opinion that nowheré in the report published by the Natural Resources Institute . . . is there a demonstration that man's use of and harvest from the waters of the Patuxent estuary adjacent to the Chalk Point Power Plant has been adversely effected [sic] by excess temperatures resulting from operations of that plant.

He ended his report with the unequivocal statement: "I must conclude that the operation of the Morgantown Power Plant, under conditions prescribed by the Department of Water Resources, will have no measurably effected [sic]."[28]

Dr. Pritchard's statement was quickly followed by one from the Director of the Natural Resources Institute, Dr. L. Eugene Cronin. In it, Dr. Cronin made a point-by-point response to the issues raised by the Chalk Point study. Then he summarized his major concerns to which "the biologists of the VIMS and members of the Potomac River Fisheries Commission concur." "a. Allow no elevation above 90 degrees F.; b. Prohibit the use of "tempering water" [a practice of drawing additional river water into the discharge canal so that the final temperature would not exceed the prescribed maximum]; and, c. The biological studies by company-hired consultants are poorly designed, contain serious errors, and are completely inadequate as a baseline of present conditions or for predictions of future effects."[29] (emphasis supplied in original) That Dr. Cronin saw fit to underline the last point makes it clear that this was a major

source of concern and disagreement.

He then went on to characterize his difference with Dr. Pritchard: "You and I differ principally in philosophy, and this should not be misconstrued. You are inclined to encourage full use of the Bay unless available knowledge proves that human uses will be impaired. I am more conservative and prefer not to risk damage to the Bay until reasonably good estimates can be made of all effects."[30] He concluded by quoting Dr. Pritchard's final statement to the effect that there would be no adverse effect from Morgantown (quoted above), and commenting on it thus: "With the best will in the world, I must say that the fragmentary information available is totally insufficient as a basis for such an absolute statement, which does not sound like your usual precise and well-qualified thinking . . . . Perhaps it is easier for physical oceanographers to make such flat predictions than for biologists. I would never make them, and feel that it is of the utmost importance that we all avoid sweeping conclusions."[31]

These two statements, issued by the two leading Maryland scientific policy advisors, provide a striking outline of the type of problem faced by Bay officials since about 1960. Dr. Pritchard laid particular stress on the public relations aspects of the controversy, thereby giving credence to one of the major theses of this study, that public opinion defines a water quality problem more than the condition of the water itself.

Dr. Cronin stated a basic difference in point of view ("philosophy" in his words) that would lead to very different government policies and actions, depending on which was adopted. And behind the debate was the question of the reliability and objectivity of the scientific findings developed by various laboratories and individual researchers.

Faced with these unresolved (and perhaps unresolvable) questions, Governor Mandel, at the request of the General Assembly, appointed a commission to study the matter. Under the chairmanship of Dr. William W. Eaton, the committee examined the record both as to the thermal and nuclear issues. In late December, it issued its report, saying in effect that the Calvert Cliffs plant, if built under the standards imposed by the Department of Water Resources and the Department of Health and Mental Hygiene, would not pose a threat to the Bay.[32]

The commission was clearly impressed by the economic argument that the Bay represented a valuable resource as a cooling medium. It pointed out that the entire Maryland portion of the Bay would only be elevated in temperature by 1.5 degrees F. by 30 power plants the size of Calvert Cliffs (assuming even distribution of the waste heat), and it concluded therefrom: "Research to find what fraction of the potential several hundred of millions of dollars cost of artificial cooling systems can be

avoided through Bay use hardly needs economic justification." In March of 1970, Dr. Cronin and the principal investigator at Chalk Point, Dr. Mihursky, issued a press release in which they itemized a number of unanswered questions regarding the effects of the plant, and suggesting that a strong research program be adopted to address those questions. If the plant is approved, they said, and is proven to have adverse effects, penalties should be imposed and immediate corrective action taken.[34]

The document also included additional statements by Drs. Cronin and Pritchard. The former stated his basic precept: "It is of the utmost importance that the effects of large environmental changes be estimated with reasonable accuracy prior to decision and commitment on those changes."[35] The latter commented: "It is an unfortunate fact that much of the research on the effects of thermal discharges into natural bodies have [sic] been biased, even though possibly unconsciously, towards either showing that no damage occurs, or is intended to prove the conservationist's opinion that catastrophic damage will result from such discharges. While it will be difficult to assure that all research personnel are free from some bias in this matter, particularly in view of recent events here in Maryland, steps could be taken to assure an unbiased review and research guidance procedure."[36]

In May 1970, the Department of Water Resources issued its final permit to the Baltimore Gas and Electric Company, which allowed the appropriation of roughly 3.5 billion gallons of water per day for passage through the plant as cooling water. This permit disposed of the principal water quality hurdle at the state level, and was followed in 1971 by a Certificate of Public Convenience issued by the Maryland Public Service Commission, a writeoff by the U. S. Environmental Protection Agency to the Atomic Energy Commission, a Maryland Wetlands Permit, and eventual approval by the Atomic Energy Commission itself. (It should not be thought that approvals were straightforward and without difficulty. There were numerous legal and administrative issues involved in this project that would take a book-length manuscript to detail, including the landmark decision by the U. S. District Court of Appeals in July 1971, that found the AEC totally inadequate in its fulfillment of the requirements of the National Environmental Policy Act. The details surrounding the various permits issued by Maryland alone occupy several file drawers.) The Calvert Cliffs plant began operation in 1974, and in 1976 produced more electricity than any other nuclear power plant in the free world.[37] In 1980, the company claimed that $400 million had been saved as compared to generating the same amount of electricity using oil as fuel.[38]

While this major conflict was erupting in Maryland, Virginia went about the business of approving a nuclear power plant on the James River at Hog Island with little fanfare and no visible

controversy. In the words of the Director of the Water Pollution Control Board, it "went through as slick as a whistle."[39] The absence of controversy itself presents a problem in analysis, because there is much less in the written record from which to judge why things were so different south of the Potomac. The Virginia Fisheries Commission did comment in a general way that thermal pollution was an additional threat to the Bay, but there was no overt attention to the Surry Plant. One fact that no doubt contributed to the smoother approval process was that the hydraulic model for the James was available to test the physical effects of waste heat discharge. Working under contract with VEPCO, scientists from CBI were apparently able to satisfy Virginia scientists and government officials that these thermal effects would not have adverse biological consequences. That the whole process in Virginia occurred several years before the Morgantown and Calvert Cliffs issues in Maryland probably made for a smoother approval. There was no in-state research that alleged adverse effects of other power plants, and the Chalk Point work in Maryland was just emerging as the Surry Plant was going through its final approvals in 1967. The state permit process was significantly less cumbersome in Virginia, so that decisions were more focused both in place and time. Perhaps most significantly, there was no concentrated neighborhood or conservation group opposition, as in Maryland, and little comment on the project by the press. By the time the Bay-wide press began to treat wastes as a major issue (see below), the Surry Plant had already been approved and was well along to completion. Thus, the issue that perhaps steamed the tempers of more persons in Maryland, if not the waters of the Bay, caused narry a mild fever in Virginia.

During the 1960's, the interstate management of the Potomac and Susquehanna Rivers came under consideration. The states of New York, Pennsylvania, and Maryland joined together to form a Susquehanna River Basin Advisory Commission. Their task was to develop a compact mechanism to address the management of interstate issues.

Because very little of the river is in Maryland, Maryland officials were chiefly interested in addressing the relation of the river to the Chesapeake Bay. The tremendous freshwater inflow of the river was recognized as the controlling influence on the salinity and long-term circulation of the upper Bay. Moreover, the Bay receives the wastes carried by the Susquehanna to its mouth. Maryland sought to use the proposed compact to address its interests in both the quantity and quality of Susquehanna River flows.

In the mid-1960's, various Maryland resources agency officials participated in discussions considering regulation of flows in the Susquehanna. As in Virginia on the James, there was general support for a regimen that would reduce flooding and

increase minimum flows. Such an approach would tend to increase the range of the oyster while reducing the range of its principal enemies. In addition, reduction in spring floods would reduce the bacterial contamination that every year required the closing of the upper Bay to shellfish harvesting in the Spring months.

Much of the interest in the Susquehanna in the early 1970's arose from the severe drought experienced by the Eastern United States from about 1961 to 1966. The Susquehanna, as the largest Eastern river discharging to the Atlantic, was looked upon as a potential water supply source not only within the basin, but in the adjacent Delaware and Potomac basins as well. During the same period, greatly increased use of river water for irrigation was being developed, and power plants were being planned that would require substantial amounts of water for cooling.

By the end of the decade, these issues were being eclipsed by concern over the diversion of fresh water from the upper Chesapeake to the Delaware Bay via the Chesapeake and Delaware Canal. The issue began to take form in January 1968, when Dr. Pritchard, while working on a Delaware estuary problem, discovered a Corps of Engineers study done in 1934 that estimated that there was a net outflow from the Chesapeake to the Delaware Bay of slightly less than 1,000 cubic feet per second. Since the Canal was being enlarged from 250 X 27 feet to 450 X 35 feet, Dr. Pritchard reasoned that the net outflow would substantially increase. He saw this as a factor perhaps more significant to the physical and biological properties of the Bay than the other diversions of Susquehanna flow then under consideration. He made this possibility known to Maryland officials and other scientists, and began his own calculations on the probable effect of the canal enlargement.[40]

The issue was quickly picked up by government staff workers, citizens conservation groups, watermen, and the press. By early 1969, the C & D Canal had joined the list of major Bay problems, along with Calvert Cliffs, wetlands destruction, and spoil disposal, in addition to the usual concern for municipal and industrial discharges. Expressions of concern ranged from the carefully couched statements of Dr. Cronin, who said basically that the effects could not be predicted, but might well be significant, to the plaint of a waterman who suggested that the Canal be made big enough so that instead of having a dead bay (Delaware) connected to a half-dead one (Chesapeake), we could have just one big dead bay.[41]

In 1970, at the urging of members of the Maryland Congressional delegation, the Committee on Public Works of the House of Representatives held hearings on the matter. Ostensibly, the Committee was to consider whether the project, which had been authorized in 1954 and which had already been largely completed

at a cost of $65 million, should be continued.[42]

Testimony was varied. The Committee was considerably disturbed by the recommendation of a senior Department of Interior official that the project be stopped until exhaustic oceanographic and biological studies could be performed. Members expressed their dismay that a Federal agency would come forward at such a late date and make a case against a project that had been available to public and official scrutiny for so long. The Interior official responded that new information justified taking a fresh look at a large-scale project of this kind, and that the value of the Chesapeake Bay was so great that a cautious approach was called for.[43]

The key testimony came from Drs. Pritchard and Cronin, who issued statements arguing that the probable effects of completion of the project would be small, but that studies should be connected that would provide adequate physical and biological understanding of the Bay so that the long-term effects of the enlargement could be assessed. They suggested that such studies would indicate if there was a need for corrective measures (such as locks), if adverse biological effects could be attributed to the Canal.[44]

Following a recess of several weeks, the hearing reconvened with testimony from the Corps of Engineers and Drs. Pritchard and Cronin, outlining a research program to address the issues raised previously. The Committee responded favorably to the testimony, with the general sense that the project could proceed with concurrent research. The possibility that research results might indicate the need for locks was again raised, but not addressed in any detail.[45]

Three months later, a research contract was awarded to the University of Maryland in the amount of $798,600 to conduct studies of the upper Bay.[46] That work was conducted over the next several years, as well as mathematical modeling work by the Corps of Engineers to refine the estimates of the physical responses of the system to the enlargement of the canal. By the end of this study period (1972), the research was well along, the plug in the end of the canal still in place (due to lack of funds and delays related to the spoil disposal issue), and the C & D Canal was essentially a dead issue as far as Bay water quality discussions were concerned. Thus, in the space of just a few years, an issue was defined on the basis of initially obscure and largely technical data, was elevated through official and journalistic attention to the status of a crisis, and passed quickly and quietly to oblivion, to join such former issues as Eurasian milfoil and explosives testing as items removed from the Bay political agenda.

The 1960's marked the beginning of systematic attempts to

address Bay governance from a comprehensive point of view. The 1933 Chesapeake Bay authority had been the first such attempt, but it left little evidence except the document that records the conference. Beginning in 1960, however, both states and several federal agencies conducted studies or planning efforts that purported to be comprehensive, and in 1971 there was a brief attempt to address the interstate aspects of Bay governance. Bay water quality matters, although not the only element of these efforts, was certainly the dominant one, and was linked to most of the others.

The first activity was a study of water resources management in Maryland by the Board of Natural Resources. Although not specific to the Bay, it addressed a number of Bay issues, and made as its summary finding a recommendation that water management be structured at the state level so that the relations between various functional areas could be addressed.[47] This study was followed by a major study of water management in Maryland, that led in 1964 to a wholesale reorganization of the major natural resources agencies in the State. In particular, with regard to the Bay, the Department of Tidewater Fisheries was reconstituted as the Department of Chesapeake Bay Affairs, with the responsibility for developing a comprehensive plan for the management of the Bay, together with its more traditional duties of managing the sport and commercial fisheries of tidewater Maryland.[48]

Also during the early part of the decade, the Public Health Service was developing a basin-wide perspective on the Susquehanna-Chesapeake system. Starting in 1963, it established a formal Chesapeake Bay-Susquehanna River Basin Project, which was scheduled to run for six years and involve a staff of up to 75 persons.[49] The stated purpose of the project was to perform basic water quality studies and develop a basin-wide framework within which water quality and other management decisions could be made. The study staff saw its mission to bring into sharper focus the relation of the free-flowing river to the Bay.[50] Of particular interest was the question of enrichment of the Bay, which some of the researchers considered to be the most important water quality problem for the Chesapeake.

After an ambitious start, the Project became the victim of changing priorities within the Federal Water Pollution Control Administration, which came into being in 1965 and took over the water quality functions of the Public Health Service. The Project completed a number of specific studies, but never published anything approaching a comprehensive discussion of the basin.

Meanwhile, the numerous political issues on the Bay that involved questions of the effects of engineering changes raised the idea that a physical model for the entire Bay would be a

useful research tool. Various members of the Maryland Congressional delegation particularly were impressed by the range of Bay problems and the need to address them in an integrated way. In 1965, the Congress authorized the Corps of Engineers "to make a complete investigation and study of water utilization and control of Chesapeake Bay Basin . . . including . . . navigation, fisheries, flood control, control of noxious waste, water pollution, water quality control, beach erosion, and recreation." To aid in this study, the Corps was authorized to build a hydrolic model of the Bay.[51] The resulting study covered a span of approximately ten years, and led to the publications of the multi-volume Existing Conditions Report and Future Conditions Report,[52] representing by far the heftiest if not the most illuminating discussion of the complex relations between various Bay functional areas. The model was constructed in Matapeake, Maryland, and, as of this writing, has seen limited use as a research tool.

Several other federal studies focused on the Bay in the latter part of the 1960's. Both the National Estuarine Pollution Study of the FWPCA[53] and the National Estuarine Study of the Fish and Wildlife Service[54] had special sections on Chesapeake Bay, where they discussed the complex inter-functional and interstate aspect of the various water quality problems then identified. The National Council on Marine Resources and Engineering Development had a task group that made a case study of the Bay, in order to formulate policy for the coastal zone.[55] And NASA, eager to demonstrate its earth-resources capabilities, established several projects and held a symposium on the applications of space technology to the management of the Bay.[56]

The states were also active during the latter part of the decade. Maryland held a Governor's Conference on Chesapeake Bay in September of 1968 for the purpose of laying "a foundation for the orderly development of Chesapeake Bay."[57] That conference was followed in 1969 by the formation of an intrastate planning body made up of the heads of most of the state agencies having responsibilities affecting the Bay. This body, whose function was made largely obsolete by the major restructuring of state government in 1969 and 1970, was known as the Chesapeake Bay Interagency Planning Committee, and its activities resulted in the publication of a planning document.[58] In Virginia, similar focus was being placed on the James River, where at least two studies and numerous shorter publications of VIMS attempted to state the resource problems of the river, the relations between various uses, and the research and management needs posed by the increasing complexity and volume of use.[59]

Seen from the perspective of over a decade, these planning and study activities seem complex and intertwined. When considered in relation to the large number of important policy issues and controversies that were being addressed during that

same period, they are nothing short of mind-boggling. Their principal contributions are no doubt in the ways in which they influenced legislation, public attitudes, and management practices, that have since been adopted. They deserve attention today from anyone who is interested in developing similarly comprehensive approaches to problem definition, management, of planning for the future of the Bay.

The Bay has long been an irresistable subject for journalists. In the nineteenth century, articles abounded that described the delights of the Chesapeake, the abundance of its resources, and the ruggedness of its watermen. These continued, and indeed increased, in the twentieth century, with frequent treatments of the historical attractions of the Bay as well. The communities of Smith and Tangier Island, the plantations of the James River, and the Naval Academy at Annapolis were perennial favorites. National Geographic alone has had at least a half-dozen articles featuring the Bay in the last fifty years.

In the years that marked the lowest period of fisheries harvests in Maryland, particularly from the thirties to the late fifties, a favorite topic of Maryland feature writers was the decline of a once-great industry, with titles such as "The Vanishing Oyster,"[60] and "Oyster Stew."[61] By the early 1960's, a new kind of article came to be written, which raised questions about the health of the Bay and discussed in varying degrees of detail the problems facing the Bay and its manager. A sampler of titles reflects the tone and content of these articles: "Chesapeake at Bay," "Does Pollution Threaten the Bay," "The Bay on Borrowed Time," "Our Beleagured Bay," "Are They Killing Our Bay?," "The Bay: An Abused Treasure," "Great Ugly Changes Mar Chesapeake," "Changes Imperil Bay Resources."[62]

These articles show a remarkable similarity of format. Almost without exceptions they speak of the once boundless treasures of the Bay, as reported by early settlers. They detail the more quantified aspects of the Bay's resources, particularly the great oyster harvests of the late nineteenth century. They recount the declines, real and imagined, of various commercial and sport species of fish and shellfish; they itemize threats to the Bay in the form of specific projects, such as Calvert Cliffs or the C & D Canal, as well as more generalized threats such as increasing urbanization or industrialization. They quote Bay scientists and administrators, as well as persons who one state official dubbed "professional citizens," meaning persons who make their living heading environmental or citizens groups; they invariably make some reference to the "health" of the Bay, often comparing it in some way with reputedly "dead" bodies of water such as Lake Erie, Lake Michigan, or Delaware Bay. They end with a prognosis for the Bay, either optimistic, pessimistic, or problematic, depending no doubt on the humor of the author and the relative weight he gave to the various spokesmen he

interviewed or quoted.

From the standpoint of this study, these articles have an importance that is as substantial as it is immeasurable. They clearly had a pronounced influence on the politics of the Bay during this period. It is difficult to sort out cause and effect relations, but there are frequent references by scientists, legislators, and state officials to the state of public opinion as reflected in and affected by the press. Any detailed assessment of the dynamics of water quality issues during this period would have to include the press (both daily and periodical) as a major element.

Not only did this period see a quantum leap forward in the size and complexity of water quality issues, it also saw the dividing line between water and land use issues blur and occasionally disappear. The relation between land activities and water quality took several forms. Most directly, this period saw the general acceptance of, and first action on, the role of non-point source pollution on the quality of the Bay. Second, there came to be some recognition that general regional development had direct impacts on water quality. Third, there were a number of controversial projects that were opposed on water quality grounds, but at root were conflicts over land use. And, finally, there developed a special concern for the role of wetlands in the physical and biological quality of the Bay.

That land runoff was a potential pollutant had long been recognized in the Bay region. Sediment was acknowledged as a cause in the reduced run of anadromous fish well before the twentieth century. Runoff from farmland was identified as a potential source of bacterial pollution by the Baltimore Sewerage Commission in 1897. The silting over of oyster bars as a result of heavy soil erosion was at least mentioned in the nineteenth century, if not greatly worried about. But it was after 1960 that government officials and institutions began to address the issue directly, beginning with soil erosion in Maryland.

The Maryland State officials had discussed the impact of soil erosion and sedimentation prior to 1960,[63] and the Water Pollution Control Commission had concentrated on a specific aspect of soil erosion, that arising from sand and gravel operations, since the late 1940's. Special attention to both these problems was given in the Patuxent watershed. The Board began to worry about the heavy development of housing in the Bowie area, where it was announced a large new community was to be developed in a previously agricultural area. This was also the same stretch of river that had a number of sand and gravel operations, and was not very far from tidewater, where there had long been concern for the gradually diminishing depth of water in the upper estuary. By the mid-1960's, with substantial

interest from a number of legislators and local officials, the State developed a sediment control act for the Patuxent River watershed.[64] This act basically required local adoption of soil containment practices for large construction projects, backed by State enforcement powers and technical assistance. This program was adopted and successfully implemented on the Patuxent, and was extended to the entire State in 1969.[65]

Both Maryland and Virginia also faced a relatively new problem during this period with the advent on a large scale of livestock herds and feed lots near tidewater. This was considerably more of a problem in Virginia, where the concentration of hogs and cattle was higher. Large-scale feedlot operators were, in general, required to contain, if not treat, the waste from their operations, but extensive areas in Virginia were closed to shellfish harvesting at least partly as the result of agricultural land runoff. One of the difficulties of dealing with this problem was the uncertainty of causes of bacterial contamination. In a rural area there might be several sources contributing to excessive fecal coliforms: the discharge from the nearest sewage treatment plant; discharge from septic tanks; bacteria from wild animals, such as muskrats and geese; farm animals; and boats, particularly when concentrated in marinas. The difficulty of pinpointing sources, particularly over time, makes it difficult, both politically and technically, to require remedial action by one sector, even though it might be the most suspect. Runoff in the rural areas of Virginia has thus required the closure of considerable areas to shellfish harvest, without any clear prospect for corrective action.

Few areas in the country experienced more rapid growth than the Washington metropolitan in the 1960's. One consequence was an attempt by local governments to control both the rate, character, and environmental impact of that growth. A variety of means were available: conventional zoning, performance standards on new construction, and extension of public services, particularly roads, water, and sewers. In addition, the unintentional but pervasive sewer moratoria that prevailed had the effect of curtailing or redirecting growth. Many of the reasons for growth management extended well beyond environmental concerns, but protection of streams and enhancement of the Potomac estuary were also recognized as purposes for which storm water management, sediment control, and open space protection were justified. The specific programs adopted by the several major jurisdictions are too numerous and complex to itemize, but it is especially pertinent to note that local jurisdictions were recognizing that the heavy costs they were going to be required to bear in achieving advanced waste treatment of sewered wastes would perhaps be in vain if corresponding reductions were not also made in the waste loadings from non-point sources. This issue came under formal consideration on a regional basis under the aegis of the watershed planning provisions of the Federal

Water Pollution Control Act of 1972.[66]

It is a truism of environmental regulation that development projects are often opposed on environmental grounds when the actual reasons for the objection lie elsewhere. Proof of this in a particular instance is difficult, because it requires an inquiry into the motivations of those who oppose a particular project. This is well illustrated by the early experiences of the Maryland Wetlands Act, where in case after case a tidewater construction project would be opposed for reasons having nothing to do with the intent of the act. In general, opposition of small projects, such as bulkheads and piers was based on disputes over riparian rights or questions of property boundaries. In many instances, opponents of a particular project did not even bother to address the wetlands protection issues involved.[67]

In the cases that follow, the judgment that the opposition was primarily over land use rather than water quality is the authors'. The record is clear that, at least, the issues were mixed. Therefore, these cases illustrate at least that non-water quality issues became a factor in decisions that were reviewed or decided made primarily on the basis of water quality and related environmental considerations. Steuart Petroleum and Harry Lundenberg School of Seamanship are two cases, separate physically and legally, but they took place in the same neighborhood at about the same time, and were opposed by essentially the same local interests and by the Chesapeake Bay Foundation. The two cases, therefore, illustrate a common principle -- that local opposition based primarily on land use issues can have a definite and perhaps decisive effect when expressed through government involvement based on water quality.

Steuart Petroleum operated an oil handling and shipping facility on the Potomac River in lower St. Mary's County, the primary function of which was to supply the Washington metropolitan area with petroleum products. Ocean-draft ships would unload at the facility, and the oil or other petroleum product would be transferred to barges or other shallow draft craft for transport up the Potomac. In the late 1960's, Steuart announced its intention to apply for status as a free port, which would allow it to import foreign crude oil duty-free. What was an oil handling facility would become a refinery.[68]

Local opposition was swift and intense. A Potomac River protective association was formed, and opposition was focused on the fact that a building permit was required from the county commissioners before work could proceed. Opponents concentrated on the Commissioners, and alleged that the tax advantages of a major new facility, which was a prime attraction to a relatively poor rural government, would be more than offset by losses suffered by area watermen, recreation-oriented businesses, and by property owners due to the inevitable water quality

degradation that the oil facility would cause. Much was made of numerous oil spills that had occurred at the facility, and testimony from watermen was advanced that argued that catch had declined in the area due to oil pollution. Despite the Company's claims that it would operate an environmentally safe facility (and despite the fact that there was a Coast Guard station in the shadow of the facility, thereby making it virtually inevitable that any violations of pollutions statutes would be detected and prosecuted), the Commission voted to deny the necessary county permits. The Company thereafter withdrew its application for free-trade port status, and abandoned its plans. (Another refinery proposal was advanced by Steuart in 1973, which was also successfully opposed by local interests.)

Press coverage claimed it as an example of citizen concern for clean water.[69] It is arguable, however, that this was not the prime issue. The threat to local water quality was nebulous and unsupportable in advance of the construction of the facility. What was clear was that the facility would represent a major industrial intrusion, in this case an expansion, into an area notable for its isolation and natural charm.

On the other side of the narrow peninsula from the Steuart facility, St. George's Creek was being attacked by another intruder in the form of the Harry Lundenberg School of Seamanship. The school was operated by a small but politically influential union to train young people for maritime trades. In order to provide adequate draft and berthing space for the many vessels used by the school, the union embarked on a massive dredging campaign. Under permits from the Department of Water Resources, it operated its own hydraulic dredge, day and night, to dredge several hundred thousand yards of material, which it deposited within a large upland diked area across the creek from the school.[70]

Local opposition to the project was intense. It was alleged that the project had resulted in heavy sedimentation of oyster beds, that there had been oil spills from the dredge, and that the school was exceeding and breaking its permit restrictions in various ways. Neighbors also objected, understandably, to the night operations of the dredge, which made considerable noise. As a result of these complaints, various additional conditions were placed on the operations, and it was subject to several temporary shutdowns for violations.

In addition to the main dredging near the school, a permit had also been applied for to dredge a small cove on which the school owned other property, across and up the creek. With the passage of the Maryland wetlands law in 1970, a hearing on this project was held in May 1971. Local objectors to the project were numerous and passionate. They presented a litany of offenses and adverse consequences of the school's other dredging

activities, claiming above all that the school was damaging the fisheries resources of the creek through siltation, destruction of the natural bottom, and oil and other wastes from the dredge and other vessels. Investigation by various technical specialists from the Department of Natural Resources suggested that these claims were probably not well founded, and that if the creek was undergoing environmental change it was due to a large number of factors, such as development in the watershed and along the shoreline, which was having a greater cumulative effect on the creek than would the relatively localized dredging by the school. Nonetheless, the license was denied, on the basis that the wetlands act established a presumption that undisturbed wetlands (in this case submerged lands) were in the public interest, and anyone wishing to alter or destroy wetlands had to make a case that there were offsetting benefits to be derived from the project. In this instance, the school was found not to have made a sufficiently strong case that the project was beneficial. Indeed, it appeared to the hearing officer that the school's primary objective was to convert a shallow cover into a bulkheaded harbor simply out of a seaman's preference for deep water and a firm shoreline.

What emerged from the testimony of many opponents of the project was that a primary concern was the very presence of the school itself. The school, like Steuart, was an intruder that threatened to alter the character of the area for the longtime residents and the retirees that enjoyed its isolation and natural beauty. The school portended continuing physical changes to the area, and brought large numbers of strangers into an area that had been socially insular and stable. Certainly there were water quality issues involved with both projects, but the overriding concern was over more fundamental social, economic, and aesthetic changes that these two neighboring facilities represented. The water quality and wetlands statutes administered by the state simply provided the most visible means for opposing them.

Concern for wetlands protection became a national environmental issue in the 1960's. Numerous Eastern states were enacting wetlands protection laws in the late 1960's and early 1970's. On the Bay, with its extensive tidal marshlands and shallow submerged lands, Maryland enacted such a law in 1970[71] and Virginia in 1972.[72] Wetlands were recognized as important in the life cycles of waterfowl, wildlife, fish and shellfish, as mechanical buffers against erosion and tidal flooding, as sediment traps, and as sources of beneficial organic matter and nutrients for aquatic life. In the last two categories, particularly, they were seen as having a beneficial water quality role. (In Maryland there was also a major impetus to prevent land developers from enriching themselves by creating new land out of the public domain by dredging and filling. Here also, wetlands projects had land use implications that were often of more

public concern than the impact on the aquatic environment.)

Although the Virginia statute was not implemented until after the closing date for this study, the Maryland statute operated for approximately two years. Perhaps its principal interest lies in the fact that it provided for the first time a state law that required a broad examination of environmental issues relating to tidewater development. A project was to be examined based on the "ecological, economic, recreational, developmental, aesthetic, and agricultural values" it affected. This is an admittedly broad and general list, and the act gave no guidance as to what these terms meant or how they were to be weighed and balanced. Nonetheless, most tidewater development projects were brought under a broader review than they had previously been. The wetlands process was also tied indirectly to a more specific water quality evaluation, based on a complex linkage with Federal statutes. All activities requiring a state wetlands license also required a permit from the Corps of Engineers under the provisions of the Rivers and Harbors Act of 1899. This act, in turn, was linked to the Federal Water Pollution Control Act by administrative agreement between the Corps and the Federal Water Pollution Control Administration (later EPA). The Corps would not issue its permit without state approval, including a certification from the state water control agency that water quality standards would not be contravened by the project. Thus, in a crude and largely unintentional way, tidewater projects came under a form of state-federal review that included environmentally based land use analysis (wetlands considerations), protection of navigation (the historical purpose of the Rivers and Harbors Act), and water quality concerns (through the linkage to the FWPC Act). Although as a statutory and administrative framework it proved inadequate to deal with the complexities of issues like Calvert Cliffs and Hart-Miller Island, it at least represented a start in bringing together public consideration of the wide range of water quality and related environmental issues that the controversies of this era demanded. Clearly what was needed was not a static comprehensive plan for the Bay, which had been a popular cry of the late sixties, but rather a process whereby the various and often competing interests of the Bay could be evaluated and balanced, based on some broad but reasonably explicit public policies. In virtually all cases, at least the starting question has been, and will continue to be, "What effect will this project have on the water quality of Chesapeake Bay?"

Section VII Notes

1. A. H. Paessler, private interview, Richmond, Va., December 1980.

2. Reference to these Industrial Waste Symposiums appear in the Annual Reports of the Water Pollution Control Commission (after 1964 the Department of Water Resources) from 1961-1968.

3. Commissioners of Fisheries of Virginia, Annual Report, Fiscal Years 1960-1961, p. 12.

4. Virginia Marine Resources Commission (formerly Commissioners of Fisheries), Annual Report, Fiscal Years 1970-1971, p. 24.

5. Ibid., Fiscal Year 1972, p. 23.

6. State of Maryland, Proceedings of the Governor's Conference on Chesapeake Bay, Annapolis, 1968, p. II, 93.

7. Baltimore Sun, May 16, 1969.

8. See Annual Reports of the agency spanning this period.

9. John B. Pleasants, "The Tidal James, A Review," Special Report #18, Virginia Institute of Marine Science, 1971.

10. M. M. Nichols, The Effect of Increasing Depth on the Salinity of the James River, Geological Society of America 133, pp. 571f., VIMS contribution #382.

11. Virginia Marine Resources Commission, Annual Report, Fiscal Year 1972, p. 23.

12. Pleasants, op. cit., p. 109.

13. 1950 Code of Virginia, section 28.1-147.

14. Harold K. Kanarek, The Mid-Atlantic Engineers: A History of the Baltimore District U. S. Army Corps of Engineers, 1774-1974, Washington, D.C., 1977, p. 117.

15. Md. Board of Natural Resources, Annual Report, 1961,

Appendix B, p. 151 ff.

16. Ibid., p. 153.

17. Ibid., 1966 Report, pp. 8-9.

18. Letter of Joseph H. Manning, Director of the Maryland Department of Chesapeake Bay Affairs, to Senator William James, April 16, 1971. Files of the Department of Natural Resources.

19. Md. Department of Natural Resources Open File, "Submerged Lands Commission."

20. Ibid.

21. This was extracted from various files of the Maryland Department of Natural Resources. The letters cited are: James B. Coulter to Baltimore District, U. S. Corps of Engineers, dated November 17, 1970, and Joseph H. Manning to Paul McKee, dated August 27, 1971.

22. Maryland Department of Chesapeake Bay Affairs, Wetlands Hearing File, Hart-Miller Island Spoil Disposal Area.

23. As this report was being prepared, the principal citizens opponents announced that they were abandoning their opposition to the project. Radio news item, March 1981.

24. "Patuxent Thermal Studies, Summary and Recommendations," Natural Resources Institute Special Report No. 1, College Park, Maryland, January 1969.

25. "Chesapeake at Bay: A Chilling View of the Thermal Threat," Sunpapers Reprint, undated, unpaged.

26. Maryland Department of Natural Resources, Office of the Secretary, "Calvert Cliffs Nuclear Power Plant" File.

27. D. W. Pritchard, "An Appraisal of the Probable Effects of the Morgantown Electric Power Plant on the Estuarine Environment of the Potomac River," mimeo, undated (letter of transmittal to Senator Edward Hall, dated March 3, 1969), p. 1.

28. Ibid., p. 8.

29. L. Eugene Cronin, "Letter to Donald W. Pritchard," March 6, 1969, pp. 3, 4.

30. Ibid., p. 4.

31. Ibid., p. 6.

32. William M. Eaton (Chairman), Nuclear Power Plants in Maryland, Report of the Governor's Task Force, Annapolis, Maryland, December 1969.

33. Ibid., p. 51.

34. L. Eugene Cronin and Joseph A. Mihursky, press release dated March 3, 1970. Mimeo, contained in "Calvert Cliffs" File, Office of the Secretary, Maryland Department of Natural Resources, Annapolis.

35. Eaton, op. cit., p. 2, Appendix C.

36. Ibid., p. 26, Appendix D.

37. Baltimore News American, August 28, 1976.

38. Baltimore Gas & Electric Company circular to customers, "Energy News," May 1981.

39. A. H. Paessler, private interview, Richmond, Virginia, December 1980.

40. Donald W. Pritchard, private interview, Ocean City, Maryland, October 1980.

41. County Record (Queen Anne's County, Maryland), February 26, 1969.

42. Committee on Public Works, House of Representatives, "The Chesapeake & Delaware Canal," April 7, 8, and May 21, 1970, Government Printing Office, Washington, D.C., 1970.

43. Ibid., pp. 113-125.

44. Ibid., p. 273.

45. Ibid., p. 299, passim.

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47. Board of Natural Resources, "Report of the Water Resources Committee," 1961 Annual Report, p. 144 ff.

48. 1964 Laws of Maryland, Chapter 82.

49. FWPCA, "Chesapeake Bay: Susquehanna River Basins Project

for Water Supply and Water Quality Management," Government Printing Office, Washington, D.C., 1965 (Revised June 1966).

50. William Colony, private interview, Crystal City, Virginia, September 1980.

51. Section 312, Rivers & Harbors Act of 1965.

52. Baltimore District, U. S. Army Corps of Engineers, Chesapeake Bay: Existing Conditions Report (7 Volumes) 1973; and Future Conditions Report (undated) (12 Volumes).

53. Federal Water Pollution Control Administration, U. S. Department of the Interior, National Estuarine Pollution Study, Vol. III, Washington, D.C., 1969.

54. Fish & Wildlife Service, U. S. Department of the Interior, National Estuary Study, Vol. 3, Washington, D.C., 1970.

55. Ibid., p. 66.

56. NASA, "Remote Sensing of the Chesapeake Bay: Conference Report," Wallops Island, Virginia, 1971.

57. State of Maryland, Proceedings of the Governor's Conference on Chesapeake Bay, Annapolis, 1968.

58. Wallace, McHarg, Roberts, and Todd, Maryland Chesapeake Bay Study, Philadelphia, 1972.

59. See Pleasants, op. cit., and William Hargis, "James River Basin: Great Natural Resources or Problems of Developing the James River," VIMS, mimeo, 1963.

60. Baltimore Sun, July 6, 1943. See also articles in the Sun, March 30, 1931, and April 20, 1950, and Baltimore Evening Sun, January 14, 1939.

61. The Wall Street Journal, April 24, 1953.

62. These articles are contained in the Vertical Files of the Maryland Room, Pratt Memorial Library, Baltimore.

63. See Abel Wolman, John C. Geyer, and E. E. Pyatt, op. cit.

64. Annotated Code of Maryland, Natural Resources Article, Title 8, Subtitle 12, 1974.

65. Ibid., Subtitle 11.

66. P.L. 92-500, Section 208.

67. This is drawn from the personal experience of John Capper, who was Hearing Officer for approximately 150 Maryland wetlands cases in 1970-1971.

68. Maryland Department of Natural Resources, Office of the Secretary, "Steuart Petroleum" File.

69. Evening Star (Washington, D.C.), May 16, 1969.

70. The various dredging projects of the Harry Lundenberg School are contained in Maryland Department of Water Resources (now Water Resources Administration) waterway improvement files.

71. Annotated Code of Maryland, Natural Resources Article, Title 9, 1974.

72. Virginia Acts of the General Assembly, Chapter 711, 1972.

SECTION VIII

SUMMARY AND CONCLUSIONS

Concern for the quality of Chesapeake Bay is a recent development. Historic concerns were more particular.

Prior to the twentieth century, attention focused upon the health of people, not the health of the Bay. Fledgling medical science came to recognize that epidemics of malaria, yellow fever, dysentary, and cholera, related to the Bay's "disease-engendering and pestilential conditions."[1] Port wardens were charged with the task of keeping channels unobstructed while courts moderated disputes between neighbors in congested harbors. Oysters and finfish were inexhaustible.

The turn of the century brought change. Cities responded to their public health problems by developing municipal water supplies and by building confined sewer systems to carry off wastes from residences and businesses. Bay tributaries adjacent to the cities became the sink into which these vast quantities of liquid were emptied. The oyster industry, which had peaked in the 1880's, had begun its inexorable decline due to overfishing. With scarcity came conflicts -- Marylanders versus Virginians, tongers versus dredgers, public-bed oystermen versus oyster-farmers. The oyster industry suffered an even greater setback when oysters were indicted as a carrier of typhoid fever.

Following the turn of the century, oyster interests got results in response to their demands for sewerage treatment. The City of Baltimore's facility on Back River was the first major purification plant constructed in this country. But it by no means resolved the "oyster scare." Epidemics in the mid-1920's, which were linked to raw oysters, led to water quality and processing standards for oysters overseen by the U. S. Health Service. Maryland reduced oyster bed closures with a program of sewage treatment plant construction that led the nation, but Virginia legislators and courts remained unresponsive to the problem.

Meanwhile, the bacterial discharges which polluted oyster beds were joined by other effluents. In port areas the oil dumped from the bilges of vessels plying the Bay was mixed with the ubiquitous discharges from food processing plants. In addition, industrial discharges, which were concentrated in

Curtis Bay near Baltimore and on the York River in Virginia, drew the same attention. Fishery management questions continued to attract much more attention, however. Pollution (with the exception of the large oyster bed closures in Virginia) was a localized and narrow issue. Debates raged in Maryland and Virginia in the 1930's and 1940's over the appropriate practices for the harvesting of crabs and menhaden, as well as oysters.

It was not until the end of World War II that the protection of water quality became an explicit policy in both states. Impetus for these polices came largely from sport fishermen who were most concerned about the effect of pollution on small free-flowing streams rather than in the Bay. Nevertheless, periodic fish kills in tidewater areas, the persistent problem of oyster contamination in Hampton Roads, and the apparent decline of oyster productivity near the York River pulp mill contributed to a growing concern for Bay pollution.

The post-war years saw a considerable expansion in the scientific and technical work done to understand tidewater quality issues, and by the early 1960's new water quality issues joined the long-standing attention given to municipal and industrial wastes. Concern for the effects of sediments and nutrients caused attention to be directed to activities throughout the Bay watershed. The problems associated with the disposal of dredged material became a matter of intense interest, particularly in Maryland. By the mid-1960's, waste heat from electric generating plants became a prime concern in Maryland. Also, at about the same time, controversies arose in both states over a number of engineering projects that had the potential to alter the circulation and salinity patterns of biologically significant areas in the Bay. Throughout the decade of the 1960's, the Washington metropolitan area wrestled with the problem of how to dispose of the wastes of a rapidly growing metropolitan area, while at the same time restoring the quality of the badly polluted upper Potomac estuary, so that it could be used for recreation.

By 1970, attention had shifted to a concern for the overall health of the Bay. Science played a major role in broadening the perspective. Traditionally, biologists and physical scientists were most active in Bay affairs. They were called upon to study declines in species and fish kills, and to project the likely effects brought on by public works projects, new industry, or waste disposal plants. The scientist also played key roles on boards and commissions that make policy recommendations to politicians and the public. They sought after, and received, public funds for research, and to monitor public programs. Finally, they functioned in managerial roles, where they made economic, political, administrative, and legal decisions. And, as the scientific community became enthralled with the new science of ecology with its emphasis on the relationship between

organisms and their environment, scientists playing all of these roles raised the public's consciousness that the Bay is a single system.

Journalists have also played a role in creating the impression that Chesapeake Bay is a "threatened treasure." The Bay has long been a favored topic of newspaper attention. Articles about the Bay region can be grouped in three classes: travel stories extolling the attractions of the region; resource stories, giving accounts of the bounty of the Chesapeake (and, in some cases, the failure of the states to capitalize on the resource potential of the Bay); and stories expressing alarm over the Bay's decline. The last, of course, related directly to our account of water quality issues. The first two predominated up to about 1960, with the latter taking over thereafter.

Finally, the citizenry itself has contributed to the concern for the Bay's well-being. Intervenors opposed to a transmission right-of-way, or diked spoil disposal site, had the good public relations sense to argue that a new power plant would result in thermal pollution or that a dike failure could result in widespread dispersal of heavy metals. Publicity attendant to controversies of this sort increases public anxiety over the health of the Bay.

Various governmental institutions and programs have evolved to respond to Chesapeake Bay problems. Until the formation of oyster navies in both states in the 1860's, government involvement with the Bay was confined to legislation pertaining to the harvesting of fish and prohibiting the fouling of streams, both of which were enforced by local sheriffs; and to action by the courts under common law to resolve disputes about rights relating to navigation, shoreline access, and nuisance. With the rise of economic activity in the fishery, and concern for experienced or potential declines in stocks, both states formed boards or commissions to study, advise on, and finally manage, marine fisheries. These boards evolved into the Virginia Marine Resources Commission and the Maryland Tidewater Administration that exist today. This evolution has been relatively simple in Virginia, with only one simple name change in the last 80 years. In Maryland, constant legislative experimentation, and, in the last 12 years, organizational change within the Department of Natural Resources, has produced at least ten different entities responsible for the management of tidewater fisheries resources. Despite these changes, the chain of attention to the needs of the sport and commercial fisheries interests appears to have remained intact.

Both states formed boards of health in the latter part of the nineteenth century, which evolved into the present major state departments. These have both retained responsibility for municipal sewage disposal and oyster sanitation. In Maryland,

the state health agency has been a major factor in Bay management since the early 1900's, when, for roughly 40 years, it was responsible for both industrial and municipal waste treatment regulation, with support from the various conservation agencies existing over that time.

In 1939, Virginia created a regional sanitary authority for Hampton Roads, and by 1948 both states had state-wide pollution control agencies in place. Again, in Virginia, this agency retained its name and function throughout the period of this study. In Maryland, there were a number of administrative and name changes, and functional expansion to include other water management responsibilities, but the water quality function remained intact. In Virginia, the Water Control Board had primary responsibility for both municipal and industrial waste control; in Maryland, that responsibility was split between the Health Department and the Water Pollution Control Commission.

The three permanent research institutions on the Bay, Virginia Institute of Marine Science (1940), Chesapeake Biological Laboratory (1925), and Chesapeake Bay Institute (1947), have all received a substantial amount of their financial support from state and federal governments, and, in the case of the first two, have been official state agencies for at least part of their histories. Their establishment and their subsequent growth to become major factors in government decision-making, can, therefore, appropriately be mentioned under government evolution.

Federal agencies are represented first by the Corps of Engineers, which has had a continuing role in the development of navigation facilities on the Bay, and has, since 1899, regulated physical development on navigable waters, and administered oil containment, nuisance weed removal, and debris removal programs, principally centered in the major port areas. The U. S. Fisheries Commission, which became the Bureau of Commercial Fisheries, has played an important role in backing state fisheries management programs and conducting research. More important to the water quality story, the Public Health Service was an important source of early investigation on the Bay, later supervised the shellfish sanitation program of the states, and, after World War II, administered the grant and technical assistance programs established by the various federal water pollution control acts, until this function was transferred to the Department of the Interior in 1965 and later established in an independent agency, the Environmental Protection Agency.

We have completed a 300 year sweep through the history of a vast sprawling estuary in Chesapeake Bay. We close with several observations.

1. Chesapeake Bay has become an object of animistic concern.

Animism is the belief that objects have a natural life and an indwelling soul. Popular opinion suggests that the Chesapeake is in danger -- body and soul. Newspaper headlines ask, "Is the Bay Dead?," while the Chesapeake Bay Foundation exclaims, "Save the Bay!" Governor Mandel of Maryland made perhaps the strongest expression of this view when he said:

> We feel an almost sacred obligation to the Chesapeake Bay and its tributaries . . . There is concern for the health of man and some parochial interests of those whose lives will be disturbed, but the predominant concern is for the Bay itself, the Bay as a living entity.[2]

These concerns, however, leave unanswered the question of how the Bay should be governed.

2. Much of the discussion of governance of the Bay proceeds on the basis of an idealized model of how Bay management operates. The model first assumes preparation of a scientific baseline study which establishes the present condition of Chesapeake Bay. Next comes the adoption of standards which choose the desired level of environmental quality for Bay waters. These are followed by the adoption of a comprehensive plan which selects the preferred uses of Chesapeake Bay from among those consistent with the quality standards. Finally comes an implementation strategy whereby government puts the plan into effect through public works and private regulation. This study indicates that the reality of Bay management is much different.

3. In theory science is called upon to provide a "perfect" baseline of information which government can then use to rationally manage the Chesapeake Bay. In reality, scientists provide information which governments may employ in response to crises conditions on the Bay. Scientists also play a major role in shaping public perceptions of the problems of the Bay; scientists sometimes promote as problems the areas of research which most interest them.

4. When regulating the quality of Bay waters, governments often have responded to public opinion and political pressure rather than to thoughtful analysis of environmental and economic conditions. The fishery industry in general, and oystermen in particular, have been a very effective "clean water" lobby. Their demands for treatment of sewage, although selfishly motivated, have made a major contribution to improved water quality.

5. Governments are sometimes said to manage Chesapeake Bay. This is not a very accurate description of government efforts. The resource is too complex, knowledge too limited, and government too weak for Bay "management." At most, governments influence the Bay. And, sometimes, a governmental response to

a problem subsequently becomes a problem. For example, the early twentieth century decision to dispose of sewage by the "water-carriage dilution" method today contributes excessive nutrients to the Bay.

The basic concept that man could substantially alter the resources of the earth had been expressed by George Marsh Perkins in his book, The Earth as Modified by Human Action, in 1863. Although this viewpoint did not come to occupy a central place in the history of science for another century, scientists from time to time expressed concern for the Bay. In 1884, Dr. Chancellor, Health Commission of Maryland, suggested, at least by implication, that the Bay could be ruined by the sewage from Baltimore, and like many of his late twentieth century counterparts, he referred to the dead and dying Bays of Europe and other parts of the world.[3] In the 1930's, the future of the Bay was discussed at the Chesapeake Bay Authority Conference and Dr. Truitt of the Chesapeake Biological Laboratory raised questions about the combined and cumulative effects of waste disposal.[4]

The ultimate question of whether man is ecologically endangering Chesapeake Bay is beyond the scope of this report and the expertness of its authors. Some argue that the Bay, as a physically open system, cannot be killed in any biological sense, and that man's perturbations are insignificant when compared to the changes wrought by natural phenomena such as Tropical Storm Agnes in 1972. But there is little question that technology has increased man's capacity to have a bad influence on the Bay. Two events, which occurred after the study period ended, stand as stark witnesses to this capacity. A kepone spill on the James River has permanently poisoned its fishery; engineers and scientists recommend no clean-up. The recent events at Three Mile Island on the Susquehanna River, the Bay's major source of fresh water, environmentally threatened not only the whole Chesapeake Bay, but the whole Northeastern United States.

Section VIII Notes

1. Thomas Buckler, A History of Epidemic Cholera (Baltimore, 1851), p. 40.

2. Statement of Governor Marvin Mandel, before the Subcommittee of Inter-governmental Relations of the Senate Committee on Government Operation, February 4, 1970.

3. Maryland Board of Health, Report 1884, House and Senate Document I, 1884, " . . . in the course of time, Chesapeake Bay will become a distillation of all the filth of Baltimore City," p. 178.

4. See pp. 76, 82, above.

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