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John W. Warner

John Warren Kindt

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JOHN W. WARNER*
JOHN WARREN KINDT**

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* U.S. Senator (R.—Virginia); B.S. 1949, Washington and Lee University; LL.B. 1953, University of Virginia.

** Professor, University of Illinois; A.B. 1972, College of William and Mary; J.D. 1976, MBA 1977, University of Georgia; LL.M. 1978, SJD 1981, University of Virginia.

I. INTRODUCTION

The coastal areas of the world are being increasingly threatened by land-based pollution. In the United States, the Chesapeake Bay and the Narragansett Bay serve as representative examples of coastal ecological areas which are being severely stressed by pollution. In his 1984 Address on the State of the Union, President Ronald W. Reagan recognized these environmental problems and stated:

> As we develop the frontier of space, let us remember our responsibility to preserve our older resources here on Earth. Preservation of our environment is not a liberal or conservative challenge. It is common sense.
>
> Though this is a time of budget constraints, I have requested for EPA one of the largest percentage budget increases of any agency. *We will begin the long, necessary effort to clean up a productive, recreational area and a special national resource—the Chesapeake Bay.*[1]

Since colonial times, the Chesapeake Bay has been a vital resource of the United States. The Bay's popularity itself may be the single greatest cause of its decline. Each year, the Bay provides millions of pounds of seafood, supplies a huge natural habitat for wildlife, functions as a major hub for shipping and commerce, and offers a wide variety of recreational opportunities for both residents and visitors. The living resources of the Bay constitute a vital part of the United States fishing industry, since the Bay's seafood production is exceeded only by the United States catch from the Pacific Ocean and the Atlantic Ocean. Unfortunately, the Bay's seafood harvest has been declining steadily during the past several years due primarily to the deteriorating water quality in the Bay. The Bay also serves as a key commercial waterway, containing two of the five major North Atlantic ports of the United States; namely, Baltimore and Hampton Roads. Shipbuilding and other industries are directly or indirectly dependent on the Bay. If the decline of the Bay is not arrested, the economies of Maryland and Virginia will be severely impacted. Other states also will be affected by a decline in the Bay's commercial and recreational activities, and these impacts will be further compounded by the decline in the Bay's fisheries. There is widespread bipartisan support for the Bay cleanup efforts, since the Bay's ecological viability is a national issue, rather than a local or regional issue. The Reagan Administration has supported a $40 million commitment to begin the initial cleanup efforts. As part of this commitment, the Environmental Protection

1. 130 CONG. REC. H143, 145 (daily ed. Jan. 25, 1984) (State of the Union Address by President Ronald W. Reagan, ((emphasis added)), *reprinted in* H.R. Doc. No. 162, 98th Cong., 2d Sess. 1 (1984) *and* 1984 U.S. CODE CONG. & AD. NEWS D3, D8 (preliminary page numbers) [hereinafter cited as State of the Union 1984 Speech].

Agency (EPA) has involved itself in coordinating efforts (by three states and the District of Columbia) to mitigate the effects on the Bay caused by point source pollution and nonpoint source pollution.[2]

The Bay's cleanup program has important national and international ramifications for environmental protection efforts. A successful United States effort in the Chesapeake Bay region will translate into better environmental programs in other ecologically sensitive coastal areas of the United States. In addition, the research and management information generated by a successful United States cleanup effort would add impetus to the international environmental efforts to protect other coastal areas and specific ocean regions (such as the Mediterranean Sea).

II. Land-Based Pollution and the Chesapeake Bay Region

A. Delimitation of Problems

1. Overall Problems

There are two major problems associated with curbing and controlling worldwide pollution. First, it is difficult to convince the international community that pollution is a serious problem which does not always manifest itself in ways that will alarm the public—but which often is a hidden problem revealing itself only when an environmental threshold is crossed or an entire ecosystem collapses. A prime example is Lake Erie where the warnings of environmentalists were ignored because the quality reports were fairly good.[3] Then the "environmental threshold" was crossed, and the scientific community was faced essentially with an abrupt environmental collapse with no feasible way to reverse the process.[4]

The second major problem involves defining the various types of pollution. The plethora of international approaches and definitions relating to the different types of pollution tends to result in confused and overlapping legislation and tends to obfuscate the total ramifications of a particular pollution problem. The definitional problems often lead countries myopically to focus on legislation dealing with one type or source of pollution. Accordingly, it is important to recognize that pollution is a transnational problem which is more efficiently dealt with on a regional basis—rather than by individual countries. Naturally, each individual country should legislate to control pollution within its own borders, but the long-term solutions involve regional and international efforts.

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2. Speech by Senator John W. Warner before the Virginia Water Pollution Control Association (Apr. 30, 1984) (speech on file in office of Senator John W. Warner) [hereinafter cited as Senator Warner Speech].

3. Falk, *Toward a World Order Respectful of the Global Ecosystem,* 1 Envtl. Aff. 251, 252 (1971).

4. *Id.* For the congressional action which was taken to clean up Lake Erie and maintain the Great Lakes, see 33 U.S.C. § 1258 (1976 & Supp. V 1981).

The ocean covers seventy-one percent of the Earth's surface, and theoretically it constitutes the ultimate disposal site for most, if not all, of Mankind's refuse. Land-based pollution from both point sources and non-point sources is discharged directly and indirectly into the world's river basins and thereby eventually reaches the ocean. While polluted areas such as Lake Erie have been allowed to regenerate themselves by washing their wastes into the ocean, the ocean cannot do the same. Once the assimilative capacity of the ocean or of a particular ocean area is reached, the environmental threshold is crossed and irreversible despoliation is a probable result.

The process of erosion dictates that toxic substances from land disposal sites must necessarily reach the ocean at some future time—although that time may be in the distant future. The surprisingly rapid contamination of groundwater near land disposal sites even suggests that the distant future may not be so distant and that former estimates may need revision. Similarly, air-borne pollution, such as acid rain, precipitates into the ocean or falls on land where the water runoff eventually flows into the ocean. Since land disposal sites are becoming more difficult to find, Mankind has increased its focus on the ocean disposal of toxic substances and wastes, including radioactive wastes. Accordingly, it is appropriate to utilize the pollution of the ocean as a reference point from which worldwide pollution can be viewed.

2. Definitional Problems: The Impact of International and United States Pollution Issues on Decision-Makers

Defining "pollution" and the subcategories of pollution is a difficult task and complicates national and worldwide attempts to curb pollution. The result has often been a potpourri of overlapping United States legislation which conflicts with international principles and with international attempts to control pollution. The term "pollution" can be utilized to refer to: (1) any alteration in a given environment, or (2) a "threshold level of damage or interference which is legally significant."[5] The five traditional approaches to delimiting pollution include:

a. any alteration of the existing environment,
b. the right of the territorial sovereign,
c. damage per se,
d. interference with other uses of the environment, and
e. any excess beyond the assimilative capacity of the environment.[6]

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5. Springer, *Towards a Meaningful Concept of Pollution in International Law*, 26 INT'L & COMP. L.Q. 531, 532 (1977) [hereinafter cited as *Meaningful Concept*], *reprinted in* A. SPRINGER, THE INTERNATIONAL LAW OF POLLUTION 63, 64 (1983) [hereinafter cited as SPRINGER].

6. SPRINGER, *supra* note 5, at 64-79; *Meaningful Concept, supra* note 5, at 533-50.

The first two approaches lie at opposite ends of the definitional spectrum and represent the extreme approaches. A balancing of the remaining three approaches forms an eclectic solution, and a reference point for a definition is "[t]he introduction by man into any part of the environment of waste matter or surplus energy, which so changes the environment as directly or indirectly adversely to affect the opportunity of men to use or enjoy it."[7] Unfortunately, there was no formulation of a specific definition of "pollution" by the United Nations Conference on the Human Environment (Stockholm Conference or UNCHE), which was held in Stockholm in 1972.[8] However, the Stockholm Conference did formulate a quasi-definition of "marine pollution" by providing that "States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea."[9] This focus on the ocean, and on "marine pollution" in particular, not only emphasizes the importance of preventing the ocean from being the "unprotected" ultimate repository for Mankind's pollution, but also demonstrates that the ocean is a good reference point for analyzing international pollution. The quasi-definition of "marine pollution" by the Stockholm Conference endured ten years of attempts to modify it substantially, and the basics of this definition have remained relatively unscathed as they are codified in the authoritative delimitation in the 1982 United Nations Convention on the Law of the Sea (LOS Convention)[10] as formulated by the Third United Nations Conference on the Law of the Sea (UNCLOS III). Article 1, paragraph 1(4) of the LOS Convention defines marine pollution as follows:

> (4) "pollution of the marine environment" means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities;[11]

Marine pollution is basically divided into three overall categories: (1) vessel-source pollution, (2) ocean dumping, and (3) land-based pollution.

Most vessel-source pollution consists of "intentional operational discharge" generated by ships as part of their normal operations—such as oil

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7. J. McLoughlin, The Law Relating to Pollution 1 (1972).

8. Kindt, *Prolegomenon to Marine Pollution and the Law of the Sea: An Overview of the Pollution Problem*, 11 Envtl. L. 67, 92-93 (1980) [hereinafter cited as *Prolegomenon*].

9. Report of the United Nations Conference on the Human Environment, U.N. Doc. A/CONF.48/14/Rev.1, at 4, prin. 7 (revised ed. 1972) [hereinafter cited as Stockholm Report].

10. *Done* Dec. 10, 1982, *reprinted in* 21 I.L.M. 1261, U.N. Doc. A/CONF.62/122 (1982) [hereinafter cited as LOS Convention].

11. *Id.* art. 1, para. (4).

tankers cleaning their tanks by flushing them with seawater. Although tanker accidents are a well-publicized type of vessel-source pollution, the hydrocarbon pollution caused by accidents is only a small part of total vessel-source pollution.

"Ocean dumping" refers basically to pollution or pollutants which are generated on land and which are subsequently transported to the ocean for disposal. Article 1, paragraph 1(5)(a), of the LOS Convention defines ocean dumping as follows:

> (5)(a) "dumping" means:
>
> > (i) any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea;
> > (ii) any deliberate disposal of vessels, aircraft, platforms or other man-made structures at sea;[12]

It should be noted that the test for ocean dumping is the "intent" of "deliberate disposal" and that the disposal does not have to be from a vessel or barge but can be from a fixed platform such as an offshore disposal plant. While the LOS Convention utilizes only the word "dumping," the term "dumping" can refer to the attempt by a company or an industry to "dump" goods or merchandise on a particular market. Accordingly, the term "ocean dumping" should be used since it is more descriptive and helps to avoid confusion.

Since a ship may be utilized to transport pollutants to sea for disposal, confusion may arise as to whether this type of disposal should be regulated as vessel-source pollution or as ocean dumping under the provisions of the LOS Convention (and under various conventions of the International Maritime Organization (IMO)).[13] The LOS Convention provides that:

> (b) "dumping" does not include:
>
> > (i) the disposal of wastes or other matter incidental to, or derived from the normal operations of vessels, aircraft, platforms or other man-made structures at sea and their equipment, other than wastes or other matter transported by or to vessels, aircraft, platforms or other man-made structures at sea, operating for the purpose of disposal of such matter or derived from the treatment of such wastes or other matter on such vessels, aircraft, platforms or structures;[14]

The "normal operations" of a vessel do not constitute its chief function, such as the disposal of wastes at sea. Instead, the normal operations consist

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12. *Id.* art. 1, para. 1(5)(a).

13. Prior to 1982, the name of the International Maritime Organization (IMO) was the Intergovernmental Maritime Consultative Organization (IMCO).

14. LOS Convention, *supra* note 10, art. 1, para. 1(5)(b).

of the operational aspects of maintaining the vessel itself as a vessel. Accordingly, a vessel which was transporting and disposing of wastes at sea would be engaged in "ocean dumping," but if the same vessel discharged machine oil as part of maintaining the engines, the vessel would be engaged in vessel-source pollution.

The third category of marine pollution is "land-based pollution," and this category of pollution constitutes the largest menace to the environmental safety of the world. The problem is so huge that it defies scientific data-gathering, and reliable scientific figures on the overall degree of international land-based pollution are difficult to find. Consequently, most scientific studies deal with land-based pollution of certain regions of the ocean, such as the Mediterranean Sea.[15] The Mediterranean Sea has been so contaminated by land-based pollution that it could become a dead sea within the next few years. In fact, "Jacques Cousteau and Jacques Piccard have warned government officials that if present trends continue, we may see the biological death [of all] of the oceans within our own lifetimes."[16]

Fortunately, efforts have been initiated to combat the uncontrolled pollution of different ocean regions. The United Nations Environment Program (UNEP) has promoted "action plans," which encompass such areas as the Mediterranean Sea, the Caribbean Sea, and the Red Sea. In the United States, the public is finally becoming aware of United States coastal areas which are being victimized by large amounts of land-based pollution. Two of the ecologically sensitive areas of the coastal United States which are of prime concern include the Narragansett Bay and the Chesapeake Bay,[17] which to clarify and simplify future analyses are collectively referred to as just the Chesapeake Bay. The domestic focus of this article will be on the Chesapeake Bay as a representative example of a United States coastal area which is being overwhelmed by land-based pollution.

Another definitional problem involves the specific delimitation of what constitutes "land-based pollution." In its widest interpretation, land-based pollution consists of all pollution which is generated on land and which is generally transported to the ocean by the action of water upon the landmasses. Accordingly, land-based pollution includes groundwater pollution and river basin pollution which eventually reaches the ocean, as well as "air-borne pollution" which precipitates both onto landmasses and into the ocean. A well-known manifestation of air-borne pollution is "acid rain" which is also known as "acid precipitation" or "acid deposition," and which can occur as acid snow or acid hail.[18] Air-borne pollution does not necessarily have to

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15. *See Mediterranean States to Bear Cost of Plan Against Pollution,* U.N. CHRON. REV., Mar. 1979, at 30.

16. McManus & Schneider, *Shipwrecks, Pollution & the Law of the Sea,* NAT'L PARKS & CONSERVATION MAG., ENVTL. J., June 1977, at 10, 10 (two outstanding environmental authors).

17. S. REP. No. 233, 98th Cong., 1st Sess. 12-14 (1983).

18. *See* NAT'L ACAD. SCI., ACID DEPOSITION 1-11 (1983).

be deposited in a "wet" form, and it can be deposited in a "dry" form. However, such "dry" deposits are generally subject to the process of precipitation and thereby become a part of the migration of pollutants to the ocean. To avoid confusion, "acid rain" is the term which should be utilized to refer to both wet and dry air-borne depositions.

Land-based pollution can be further categorized as point source pollution or nonpoint source pollution. Point source pollution consists of pollution which can be traced to a specific source. By comparison, the origins of nonpoint source pollution can be identified only in general terms. Historically the major type of nonpoint source pollution has been agricultural runoff. The conservation of farmland, and specifically topsoil, is a vital concern to every country. Unfortunately, even the most careful cultivation methods necessarily result in some loss of topsoil through wind and water erosion. With the advent of the widespread use of economic poisons (or "organicides")[19] after World War II, agricultural runoff involved not only the loss of soil and the leaching of important soil chemicals, but also the seaward migration of the organicides; namely, (1) herbicides, (2) pesticides (that is, chlorinated hydrocarbons), and (3) insecticides.[20] The runoff of these organicides contaminates groundwater, streams, river basins, and eventually, ocean areas.

Accordingly, land-based pollution involves four major categories of pollution: (1) air-borne pollution (such as, acid rain); (2) leachate from solid and toxic waste landfills; (3) direct discharges into river basins or coastal waters (point source pollution); and (4) erosion (agricultural runoff and other nonpoint source pollution). The point source pollution is the easiest to regulate since it can be controlled de jure at the source. Whether or not point source pollution is regulated de facto is debatable, because standards for acceptable pollution levels and enforcement methods vary between countries. In any event, most industrialized countries have recognized the need to control point source pollution and are making bona fide efforts to do so. More recently, it has been recognized that there is a need to control leachate from land-based disposal sites for solid and toxic wastes. In the United States, the leachate situation at Love Canal was well publicized and prodded enactment of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund or Environmental Response Act).[21]

The international aspects of air-borne pollution are quite controversial and emphasize the need for an international approach to pollution issues. Theoretically, the questions involving air-borne pollution constitute the vanguard for future methodologies for dealing with international pollution. The

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19. *See* Kindt, *Marine Pollution and Hydrocarbons: The Goal of Minimizing Damage to the Marine Environment*, 14 CAL. W. INT'L L.J. 233, 269-85 (1984).

20. *Id.*

21. Pub. L. No. 96-510, 94 Stat. 2767 (1980) (codified at 42 U.S.C. §§ 9601-9615 (Supp. V 1981)).

major problem with regulating air-borne pollution is that it is difficult to establish a nexus between the point source and the eventual injury. While point sources are readily identifiable, the wide dispersion of air-borne pollution makes it almost impossible to fix responsibility for a particular environmental injury on a particular point source. Complicating the difficulty of establishing a nexus is the widespread nature of the injury itself.

A final definitional problem involves the seven basic categories of ocean wastes which were identified by the United States Council on Environmental Quality (CEQ).[22] Since these categories have been repeated throughout environmental literature, they provide touchstones for analyses involving pollution—particularly analyses involving United States legislation. These seven categories and their definitions are as follows:

> a. "*Dredge spoils*—the solid materials removed from the bottom of water bodies generally for the purpose of improving navigation: sand, silt, clay, rock, and pollutants that have been deposited from municipal and industrial discharges."[23]
> b. "*Industrial wastes*—acids; refinery, pesticide, and paper mill wastes; and assorted liquid wastes."[24]
> c. "*Sewage sludge*—the solid material remaining after municipal waste water treatment: residual human wastes and other organic and inorganic wastes."[25]
> d. "*Construction and demolition debris*—masonry, tile, stone, plastic, wiring, piping, shingles, glass, cinderblock, tar, tarpaper, plaster, vegetation, and excavation dirt."[26]
> e. "*Solid waste*—more commonly called refuse, garbage, or trash—the material generated by residences; commercial, agricultural, and industrial establishments; hospitals and other institutions; and municipal operations: chiefly paper, food wastes, garden wastes, steel and glass containers, and other miscellaneous materials."[27]
> f. *Explosives and chemical munitions*—no official definition but includes "[u]nserviceable or obsolete shells, mines, solid rocket fuels, and chemical warfare agents."[28]
> g. "*Radioactive wastes*—the liquid and solid wastes that result from processing of irradiated fuel elements, nuclear reactor operations, medical use of radioactive isotopes, and research activities and from equipment and containment vessels which become radioactive by induction."[29]

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22. COUNCIL ON ENVTL. QUALITY, OCEAN DUMPING 1-8 (Report to the President, 1970) [hereinafter cited as OCEAN DUMPING REPORT].
23. *Id.* at iv.
24. *Id.*
25. *Id.*
26. *Id.*
27. *Id.*
28. *Id.* at 6.
29. *Id.* at iv.

The last two categories of "explosives" and "radioactive wastes" have definite parameters and are relatively easy to identify, but the other five categories overlap each other. Sometimes the terms "sewage sludge" or "solid wastes" are utilized individually to refer to all of these collective categories, except for "radioactive wastes"—which are generally treated as an altogether separate category. Since all of these wastes are "solid," the term "solid wastes" should be the overall term with the other terms delimiting the subcategories.

The major categories of pollutants can be conveniently divided into: (1) hydrocarbons—which include not only oil and gas, but also the derivative organicides—herbicides, pesticides (chlorinated hydrocarbons), and insecticides; (2) toxic metals—which include the heavy metals; (3) radioactive wastes; (4) particulate pollution; and (5) solid wastes. This final category of solid wastes includes all of the seven CEQ listings except for radioactive wastes. Specifically, the subcategories of solid wastes should be: (1) dredge spoils, (2) industrial spoils (including the hydrocarbon organicides), (3) sewage sludge, (4) construction and demolition debris, (5) solid wastes (more appropriately termed "refuse" or "garbage"), and (6) explosives and chemical munitions. Again, the definitions tend to be confusing as they are commonly utilized in legislation. For example, under the Clean Water Act of 1977,[30] which amended the Federal Water Pollution Control Act of 1972 (FWPCA),[31] regulations "providing guidelines for sludge use and disposal were required to be published within one year of enactment"[32] of the Clean Water Act of 1977. While the EPA studied the sewage sludge problem for years thereafter, the EPA did not publish the required regulations.[33] Three major hindrances to achievement of this EPA mandate were apparent: (1) the difficulty in delimiting sewage sludge as a distinct pollution category separate from other toxic pollutants (since other toxic pollutants invariably become mixed into the sewage sludge), (2) the dearth of reliable scientific data, and (3) the enormity of the task of managing sewage sludge.[34] In any event, the EPA is pursuing a program of identifying and issuing regulations for individual "toxic pollutants found in sludge."[35] By "toxic pollutants" the EPA is presumably identifying components of the two major categories mentioned earlier; specifically, hydrocarbon organicides and toxic metals. The term "sludge" presumably refers to the CEQ concept of sewage sludge or "solid material remaining after municipal waste water treatment."[36] While

30. Pub. L. No. 95-217, 91 Stat. 1566 (1977) (codified as amended in various sections of 33 U.S.C. § 1251 *et seq.* (Supp. V 1981)).

31. 33 U.S.C. §§ 1251, 1254, 1256, 1262, 1288 (1976 & Supp. V 1981).

32. S. REP. No. 233, 98th Cong., 1st Sess. 10 (1983); 33 U.S.C. § 1345(d) (Supp. V 1981).

33. S. REP. No. 233, 98th Cong., 1st Sess. 10 (1983).

34. *Id.*

35. *Id.*

36. OCEAN DUMPING REPORT, *supra* note 22, at iv. *See supra* note 25 and accompanying text.

these terms can be deciphered by personnel working in the environmental area, there is an apparent need for a more concise definitional focus and for more precise definitions overall. In fact, the codification of both the FWPCA and the Clean Water Act has a lack of definitions.[37]

3. Resources and Environmental Problems of the Chesapeake Bay Region

For purposes of analysis, the resources of the Chesapeake Bay should be divided into the nonliving resources and the living resources.[38] The water itself is a nonliving resource which is capable of being developed for its ore content or desalinated into fresh water. While the future utilization of the waters of the Chesapeake Bay for these purposes appears highly unlikely, deforestation, climatic, and population trends[39] may change the needs of the region as the United States populace continues its move to coastal areas. It would be unwise to preempt the future development of resources based on current assumptions which may be inaccurate. Similarly, the water quality of the Chesapeake Bay needs to be maintained to support the "ocean uses" of transportation, communication, and recreation—as well as the living resources of the Bay.

The sediments of the Chesapeake Bay might also contain undiscovered minerals. The ocean has been mined for rare minerals such as diamonds, gold, and platinum,[40] and there have been mining operations for more common minerals such as barite, calcium carbonate, and glauconite.[41] Phosphorite nodules and phosphorite rich sands are common in many coastal areas and are mined for fertilizers.[42] Sand and gravel constitute a common offshore nonliving resource which is being exploited, and it has been estimated that United States sand and gravel production from offshore sources may be worth $2.92 billion by the turn of the century.[43] The heavy minerals,

37. *See* 33 U.S.C. §§ 1321(a), 1322(a) (1976 & Supp. V 1981). Sections 1262 and 1362 also contain definitions, but they are irrelevant to the delimitation of types of pollution. Section 1322(2)(b) defining "sludge" is the only pertinent definition. *Id.* §§ 1262, 1321(a), 1322(a), 1362.

38. *See* Kindt, *Ocean Resources and Marine Pollution: Putting the Development of Ocean Resources in Proper Perspective,* 6 HOUS. J. INT'L L. 111 (1984).

39. *See* Kindt, *The Effect of Claims by Developing Countries on LOS International Marine Pollution Negotiations,* 20 VA. J. INT'L L. 313, 317-18 (1980); *Prolegomenon, supra* note 8, at 68-69.

40. F. EARNEY, PETROLEUM AND HARD MINERALS FROM THE SEA 22-23, 26-27 (1980); J. MERO, THE MINERAL RESOURCES OF THE SEA 78-79 (2d ed. 1969) (the classic work on nonliving ocean resources).

41. EARNEY, *supra* note 40, at 9, 19-20; *see* Kimrey, *Resource Research and Assessment of Marine Placers,* in U.S. DEP'T COM., PROCEEDINGS OF THE MARINE MINERALS WORKSHOP 121, 122-26 (1976).

42. EARNEY, *supra* note 40, at 25-26; MERO, *supra* note 40, at 57-59, 67-73.

43. EARNEY, *supra* note 40, at 25 (the 1974 value of sand and gravel was $1.46 billion); *see* McKenzie, *Resource Research and Assessment of Sand and Gravel,* in U.S. DEP'T COM., PROCEEDINGS OF THE MARINE MINERALS WORKSHOP 105, 105 (1976) (value of United States sand and gravel production expected to double by turn of century).

the phosphorites, and the sand and gravel deposits apparently constitute seventy percent of the world's continental shelf areas.[44] The potential mineral wealth of coastal areas becomes apparent when these nonliving resources are combined with the potential development of as yet undiscovered offshore oil and gas sources (which are expected to provide fifty percent of the world's oil and gas production between 1990 and 2000).[45] While these nonliving resources are not being developed on a large scale within the Chesapeake Bay, an awareness of potential mineral discoveries provides perspective with regard to analyses of future management policies for the Bay. If the sediments of the Bay are too polluted by organicides or toxic metals, then dredging or other development operations will create serious environmental problems for the food chain—by reintroducing the relatively dormant organicides and toxic metals lying in the sediments. As a naturally protected area from the ocean, the Chesapeake Bay theoretically constitutes a prime location for the future development of ocean resources.

In October of 1977, ten problem areas involving the Chesapeake Bay were identified. These problem areas were:

a. the accumulation of toxic substances,
b. nutrient enrichment,
c. submerged aquatic vegetation (SAV),
d. dredging and dredged material disposal,
e. fisheries modification,
f. hydrologic modification,
g. shellfish bed closures,
h. shoreline erosion,
i. water quality effects of boating and shipping, and
j. wetlands alteration.[46]

Thereafter, the first three categories were delimited as the areas of primary concern, and most of the subsequent efforts concentrated on these categories.[47] Accordingly, future analyses will highlight the Bay's problems of nutrient enrichment, decreased SAV, and high concentrations of organicides and toxic metals.

Scientific data on the Chesapeake Bay between 1950 and 1980 indicate that the water quality is deteriorating in most regions due partially to the increasing amounts of nutrients flowing into the Bay via its tributaries.[48] The

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44. Wenk, *The Physical Resources of the Ocean,* in THE OCEAN 83, 87 (1969) (a classic article on the overall, physical ocean resources).

45. EARNEY, *supra* note 40, at 36; *see* Jones, *Understanding the Offshore Oil and Gas Controversy,* 17 GONZ. L. REV. 221, 223 (1982) (between 1990 and 2000 production of offshore wells expected to be 24 million barrels per day).

46. ENVTL. PROTECTION AGENCY, CHESAPEAKE BAY PROGRAM TECHNICAL STUDIES: A SYNTHESIS 2 (1982) [hereinafter cited as CHESAPEAKE SYNTHESIS].

47. *Id.*

48. ENVTL. PROTECTION AGENCY, CHESAPEAKE BAY PROGRAM: FINDINGS AND RECOMMEN-

exceptions appear to be in those tributaries where pollution control efforts have been initiated; that is, primarily the James, Patapsco, and Potomac Rivers.[49]

Another problem involves the large areas of the Chesapeake Bay which have low or no dissolved oxygen (DO),[50] and between 1950 and 1980, the size of these areas increased by a multiple of fifteen.[51] The extent of the DO problem is evidenced by the fact that "from May through September in an area reaching from the Annapolis Bay Bridge to the Rappahannock River, much of the water deeper than 40 feet has no oxygen and, therefore, is devoid of life."[52] Eutrophication, which is caused by the excessive nutrients, is slowly conquering the Bay and its living resources. A concomitant problem involves increased levels of chlorophyll *a,* which are also impacting on the Bay.[53]

Studies have also revealed high concentrations of "toxic organic compounds,"[54] (which are more appropriately referred to as just "organicides"). These high concentrations have been discovered not only in those sediments near industrial sites where they would be expected, but also in less likely areas such as river mouths and other areas with turbidity.[55] Unfortunately, the benthic organisms at these locations "tend to accumulate the organic compounds in their tissues."[56]

The water column and sediments of the Bay have also been contaminated by toxic metals.[57] The industrialized areas of the Elizabeth and Patapsco Rivers have sediments "with concentrations greater than 100 times [the] natural background levels."[58] High levels of toxic metals were also found in the mid-Bay and in parts of the James, Potomac, Rappahannock, and York Rivers.[59] Some of the organicides and the toxic metals are apparently "being bioconcentrated by plankton, shellfish, and finfish."[60]

The living resources of the Chesapeake Bay are generally known, and there are over 200 species of nekton, which include fish, squid, some

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DATIONS 22 (1983) [hereinafter cited as CHESAPEAKE BAY FINDINGS]; *see* ENVTL. PROTECTION AGENCY, CHESAPEAKE BAY: A FRAMEWORK FOR ACTION 15 (1983) [hereinafter cited as CHESAPEAKE FRAMEWORK].

49. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 22; *see* CHESAPEAKE FRAMEWORK, *supra* note 48, at 15.

50. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 22.

51. *Id.;* CHESAPEAKE FRAMEWORK, *supra* note 48, at 15.

52. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 22; CHESAPEAKE FRAMEWORK, *supra* note 48, at 15.

53. CHESAPEAKE FRAMEWORK, *supra* note 48, at 15.

54. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 22.

55. *Id.*

56. *Id.*

57. *Id.*

58. *Id.* at 24.

59. *Id.* at 22, 24.

60. CHESAPEAKE FRAMEWORK, *supra* note 48, at 15.

crustaceans, and other invertebrates.[61] Unfortunately, the "freshwater-spawning fish, such as shad, alewife, and striped bass, have decreased in recent years."[62] Studies have indicated that there has been "fair to poor" spawning of "these and other semi-anadromous or anadromous species,"[63] which by definition spawn in fresh water but spend their lives in salt water. By comparison, the numbers of "marine-spawning fish, such as menhaden, have generally remained stable or increased."[64]

Besides injuring spawning areas, the excess nutrients, the low DO, and the high concentrations of organicides and toxic metals are killing large areas of submerged aquatic vegetation (SAV), injuring benthic life,[65] and bioconcentrating in plankton, shellfish, and finfish.[66] Oysters have been particularly vulnerable to these environmental threats and many Bay areas are "experiencing reduced oyster spat set."[67]

The scientific findings have indicated several severe threats to the resources of the Chesapeake Bay. It was once thought that the ocean could absorb an unlimited amount of wastes, but this view has been generally discredited.[68] Similarly, for years "many people believed that the Bay had an unlimited capacity to assimilate human wastes,"[69] and even if it did not have an unlimited capacity, it was believed that the wastes would eventually wash out to sea and the Bay would clean itself. The danger of making these types of assumptions is highlighted by the disquieting fact that the Bay does not really "clean itself."[70] As a result of research conducted by the Chesapeake Bay Program (CBP) under the auspices of the EPA, it has been discovered that "contaminants entering the Bay are not readily flushed out into the ocean but, because of the unique circulation pattern in the Bay, they accumulate within the estuary."[71] The Mediterranean Sea serves as a good parallel since it takes seventy to eighty years to clean its waters.[72] In 1976, the Mediterranean countries recognized their pollution problem and formulated the Convention for the Protection of the Mediterranean Sea Against Pollution (Mediterranean Protection Convention).[73] The United States

61. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 12.

62. CHESAPEAKE FRAMEWORK, *supra* note 48, at 15.

63. *Id.*

64. *Id.*

65. *Id.* at 15-16.

66. *Id.* at 15.

67. *Id.*

68. Osterberg, *Why Not in the Ocean?*, in INT'L ATOM. ENERGY AGENCY BULL., June 1982, at 30, 32, *reprinted in Management of Commingled Mill Tailings: Hearings Before the Subcomm. on Procurement and Military Nuclear Systems of the House Comm. on Armed Services,* 97th Cong., 2d Sess. 253 (1982).

69. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 19.

70. *Id.*

71. *Id.*

72. Saar & Mitchelmore, *A Stinking Puddle,* NEWSWEEK, Sept. 3, 1979, at 47, 47.

73. *Done* Feb. 16, 1976, *reprinted in* 15 I.L.M. 290 (1976) (in force as of Feb. 12, 1978) [hereinafter cited as Mediterranean Protection Convention].

needs to recognize the danger to the Chesapeake Bay and take effective remedial action before the Bay reaches the pollution levels of the Mediterranean.

B. Goals

There are three overall goals in the international environmental realm:

a. protecting common interests and rejecting special interests,
b. minimizing damage to the environment (the "negative goal"), and
c. utilizing the positive motivations of optimum order (including preserving the environment and securing its most constructive use for present and future generations).[74]

With regard to an analysis of the Chesapeake Bay, the most pertinent goal is the negative goal of minimizing damage to the environment. This overall goal includes five subgoals:

a. prevention (the long-term efforts to minimize the occasions for injury);
b. deterrence (the preclusion of injury immediately threatened);
c. restoration (the termination of injuries already in process);
d. rehabilitation (the short-term binding up of wounds); and
e. reconstruction (the long-term redesign of the situation to preclude further injury).[75]

Future legislation designed to assist the Chesapeake Bay (and indeed all United States environmental legislation) should incorporate these five subgoals.

With regard to the Chesapeake Bay, the EPA has delimited general goals involving prevention, restoration, and reconstruction, but the short-term goals of deterrence and rehabilitation need more emphasis since the Bay's problems are immediate. The EPA summarizes its "general goals and objectives" for management of the Chesapeake Bay as follows:

> The institution or management mechanism should ideally be able to influence a coordinated approach to managing the Bay's water quality and biological resources. *Its goal should be to restore and maintain the Bay's ecological integrity.* To accomplish this, the structure should ideally be able to perform or coordinate all of the tasks which relate to the objective. Those tasks include: comprehensive planning, technology transfer, data management and analysis, model refinement and development, conflict resolution, progress

74. McDougal & Schneider, *The Protection of the Environment and World Public Order: Some Recent Developments,* 45 MISS. L.J. 1085, 1089-91 (1974) (a classic article on international environmental law).

75. *Id.* at 1090.

> reporting, monitoring, research, and public information and education.[76]

It should be noted that the EPA is attempting to comply with the short-term goals of deterrence and rehabilitation by delimiting four specific subgoals:

> a. "[t]o restore and maintain the bay's ecological integrity;"[77]
> b. "[t]o reduce point and nonpoint source nutrient loadings to attain nutrient and dissolved oxygen concentrations necessary to support the living resources of the bay;"[78]
> c. to "[c]ontrol and monitor point and nonpoint sources of toxic materials to mitigate the potential or demonstrated impact of toxicants on the living resources of the bay;"[79] and
> d. "[t]o acquire information to refine the CBP environmental quality classification scheme and to develop state water quality standards based on resource-use attainability."[80]

The Environmental Quality Classification Scheme (EQCS), which "related water quality criteria to resource-use attainability"[81] was initiated under the CBP. Thus, a primary specialized goal must be the attainment of the scientific data necessary to establish equitable pollution standards and initiate a well formulated and coordinated management strategy.

The preliminary results of the CBP research indicated that the initial scientific orientation was "to describe the current conditions of the Bay in objective, quantitative terms rather than to point out problems, explore causes, and suggest solutions,"[82] and thereafter, the CBP Management Committee "insisted that the scientific researchers had a responsibility to tell them what needed to be done to reverse the declining resource trends which they had identified in the Bay."[83] These pressures resulted in three CBP reports. The first was a synthesis of forty-five scientific reports which "pushed" the science to design a management scheme.[84] Secondly, an analysis of trends was developed in a report,[85] and finally a management report was compiled.[86] The United States Congress has recognized the need to achieve

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76. CHESAPEAKE FRAMEWORK, *supra* note 48, at 218 (emphasis added).
77. *Id.* at Management Recommendations (no page number available).
78. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 39.
79. *Id.* at 44.
80. *Id.* at 37.
81. *Id.* at 36.
82. S. REP. No. 233, 98th Cong., 1st Sess. 13 (1983).
83. *Id.*
84. CHESAPEAKE SYNTHESIS, *supra* note 46, at i; *see* S. REP. No. 233, 98th Cong., 1st Sess. 13 (1983).
85. CHESAPEAKE FRAMEWORK, *supra* note 48, at Foreward; *see* S. REP. No. 233, 98th Cong., 1st Sess. 13-14 (1983).
86. CHESAPEAKE BAY FINDINGS, *supra* note 48, at v; *see* S. REP. No. 233, 98th Cong., 1st Sess. 14 (1983).

the Chesapeake Bay goals set by the EPA, and these EPA goals are specifically identified as part of the justification for amending the Clean Water Act of 1977.[87]

C. *Historical Background*

1. International and Regional Conventions

The 1972 Stockholm Conference on the Human Environment delegated to UNCLOS III much of its authority to design regulations for the marine environment,[88] which necessarily includes seventy-one percent of the Earth's surface. The LOS Convention, which was formulated and completed by the UNCLOS III delegates on December 10, 1982, contains comprehensive provisions governing marine pollution,[89] particularly land-based pollution,[90] ocean dumping,[91] and vessel-source pollution.[92] In fact, the definitions and categorizations mentioned earlier in this analysis[93] are all directly supported by or are compatible with the LOS Convention and its enumerated principles. For example, the air-borne pollution provisions of the LOS Convention are obviously a subcategory of the provisions governing land-based pollution,[94] which is the same categorization described earlier in this analysis.[95]

As a general rule, land-based pollution as delimited by the LOS Convention is to be regulated by individual countries.[96] Accordingly, land-based pollution is under the jurisdiction and concomitant regulatory authority of the country generating the pollution. Despite this national jurisdiction, regional and international cooperation is encouraged[97] since it is recognized that land-based pollution is often regional and international in scope. There is an increasing trend in international law to hold individual countries liable for the pollution which is generated in one country and which injures another country or its nationals.[98] This trend should be an added incentive for individual countries to participate in regional and international approaches to solving transnational pollution problems. Notable regional efforts are

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87. S. REP. No. 233, 98th Cong., 1st Sess. 12 (1983). *See supra* notes 77-80 and accompanying text. Senate Report Number 233 only identifies three of the four EPA goals, but the fourth EPA goal of restoring and maintaining the ecological integrity of the Bay is implicit in the other three goals.

88. *See* Stockholm Report, supra note 9, at 23.

89. LOS Convention, *supra* note 10, arts. 192-237.

90. *See, e.g., id.* arts. 207, 212-13, 222.

91. *Id.* arts. 210, 216.

92. *Id.* arts. 211, 217-21.

93. *See supra* notes 5-37 and accompanying text.

94. *Compare* LOS Convention, *supra* note 10, arts. 207, 213, *with id.* arts. 212, 222.

95. *See supra* notes 21-22 and accompanying text.

96. LOS Convention, *supra* note 10, arts. 207, 213.

97. *Id.* arts. 197-201.

98. *Prolegomenon, supra* note 8, at 84-89.

underway in the Baltic Sea and the Mediterranean Sea.[99] These types of regional efforts should be encouraged.

Other jurisdictional considerations found in the LOS Convention are compatible with the unique aspects of the Chesapeake Bay. While all of the provisions of the LOS Convention which impact upon the Chesapeake Bay are compatible with United States policy, the United States did not accept the LOS Convention—primarily because of its inequitable and onerous provisions involving deep seabed mining. In any event, the Chesapeake Bay itself constitutes a "historic bay" under article 10, paragraph 6, of the LOS Convention,[100] because the Bay has historically been claimed and exclusively utilized by the United States—regardless of the fact that it is wider than the area which would be subsumed by the traditional United States territorial sea claims of three miles. Accordingly, the Bay is under the exclusive jurisdiction of the United States.

The anadromous stocks which spawn in the Bay are also under United States jurisdiction, but if any of these stocks were to swim out to sea (even thousands of miles), United States jurisdiction would follow them wherever they went.[101] The Alaskan salmon constitute the best example of this type of jurisdiction, but this jurisdiction would obviously apply to any of the East Coast anadromous species which had similarly wide ranges. Of course, regional cooperation is encouraged under article 66, paragraphs 4 and 5, of the LOS Convention.[102] By comparison, catadromous species spawn in salt water and spend most of their lives in fresh water. Under article 67, paragraph 1, of the LOS Convention a "coastal State in whose waters catadromous species spend the greater part of their life cycle shall have responsibility for the management of these species and shall ensure the ingress and egress of migrating fish."[103] However, it should be remembered that there is an international trend toward imposing liability for any contamination of anadromous or catadromous stocks affecting foreign fishermen, as well as for any land-based pollution injuring other countries (such as acid rain) or any pollution from offshore installations (such as spills from offshore oil wells).[104]

International awareness of the quantity of land-based pollution and efforts to combat this pollution are still in their infancy. Nevertheless, several important initiatives have been promoted, and several important regional and international conventions have been negotiated. In general chronological order, the major agreements impacting upon land-based pollution are as follows:

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99. *See supra* notes 72-73 and accompanying text.
100. LOS Convention, *supra* note 10, art. 10, para. 6.
101. *Id.* art. 66.
102. *Id.* art. 66, paras. 4-5.
103. *Id.* art. 67, para. 1.
104. *See Prolegomenon, supra* note 8, at 84-90.

a. Convention on the Protection of the Environment[105] (an agreement between Scandinavian countries),
b. Convention for the Prevention of Marine Pollution from Land-Based Sources (Convention on Land-Based Pollution),[106]
c. Convention on the Protection of the Marine Environment of the Baltic Sea Area,[107]
d. Convention for the Protection of the Mediterranean Sea Against Pollution,[108]
e. Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft,[109]
f. Protocol Concerning Co-operation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency,[110]
g. Kuwait Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution,[111] and
h. Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources.[112]

The Mediterranean Protection Convention has been the most successful regional effort, and it designed the Mediterranean Action Plan and a concomitant "Blue Plan" to combat pollution.[113] Three related protocols have also been adopted as part of the efforts initiated under the Mediterranean Protection Convention.[114] More regional and international efforts modeled on the Mediterranean system need to be encouraged.

2. United States Legislation

The United States has generally attempted to harmonize its environmental legislation with the principles enumerated by international conventions and organizations. While more needs to be done, the United States can validly be credited with being in the international vanguard with regard to much of its environmental legislation. Since land-based pollution is primarily under the jurisdiction of the country generating the pollution, a brief review of the major United States legislation is useful. The primary United States laws

105. *Done* Feb. 19, 1974, *reprinted in* 13 I.L.M. 591 (1974).
106. *Opened for signature,* June 4, 1974, *reprinted in* 13 I.L.M. 352 (1974).
107. *Done* Mar. 22, 1974, *reprinted in* 13 I.L.M. 546 (1974).
108. Mediterranean Protection Convention, *supra* note 73.
109. *Done* Feb. 16, 1976, *reprinted in* 15 I.L.M. 300 (1976) (in force as of Feb. 12, 1978).
110. *Done* Feb. 16, 1976, *reprinted in* 15 I.L.M. 306 (1976) (in force as of Feb. 12, 1978).
111. *Adopted* Apr. 1978, *reprinted in* 17 I.L.M. 511 (1978). The Kuwait Action Plan Region established by this convention is modeled after the Mediterranean Action Plan and its convention.
112. *Adopted* May 17, 1980 (in force as of Aug. 24, 1983).
113. *See* Boxer, *Mediterranean Action Plan: An Interim Evaluation,* SCI., Nov. 10, 1984, at 585, 587; *Mediterranean States to Bear Cost of Plan Against Pollution,* U.N. CHRON. REV., Mar. 1979, at 30; Thacher, *United to Protect the Mediterranean,* OCEANS, Jan. 1977, at 58.
114. *See supra* notes 109, 110 & 112 and accompanying text.

which interface with land-based pollution and air-borne pollution are as follows:

a. the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIFRA),[115]
b. the Clean Air Act of 1963,[116]
c. the National Environmental Policy Act of 1969 (NEPA),[117]
d. the Clean Air Act Amendments of 1970,[118]
e. the Federal Water Pollution Control Act of 1972,[119]
f. the Toxic Substances Control Act of 1976 (TOSCA),[120]
g. the Resource Conservation and Recovery Act of 1976 (RCRA),[121]
h. the Clean Air Act Amendments of 1977,[122] and
i. the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.[123]

These major United States laws are amended and supplemented by:

a. the Clean Water Act of 1977,[124]
b. the Federal Environmental Pesticide Control Act of 1972 (FEPCA)[125] (amending FIFRA),
c. the Occupational Safety and Health Act of 1970 (OSHA),[126]
d. the Safe Drinking Water Act of 1974 (SDWA),[127]
e. the Hazardous Materials Transportation Act of 1975 (HMTA),[128]
f. the Water Quality Control Act of 1965 (WQCA),[129] and

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115. 7 U.S.C. §§ 121-136 (1976).
116. 42 U.S.C. §§ 1857-1858(a) (1976 & Supp. V 1981).
117. 42 U.S.C. §§ 4321-4347 (1976 & Supp. V 1981).
118. 42 U.S.C. §§ 1857-1858(a) (1976 & Supp. V 1981).
119. 33 U.S.C. §§ 1251-1376 (1976 & Supp. V 1981).
120. 15 U.S.C. §§ 2601-2629 (1976 & Supp. V 1981).
121. 42 U.S.C. § 6901 *et seq.* (1976 & Supp. V 1981). The RCRA replaced the Solid Waste Disposal Act of 1965 and supplemented the Resource Recovery Act of 1970, which had provided financial assistance to build solid waste treatment facilities and funds to conduct related research.
122. Pub. L. No. 95-95, 91 Stat. 685 (1977) (codified in various sections of 42 U.S.C. § 7401 *et seq.* (Supp. V 1981)). The Clean Air Act of 1955, 42 U.S.C. §1857 *et seq.* (1976) was completely revised by Pub. L. No. 95-95, 91 Stat. 685 (1977) and transferred to 42 U.S.C. §§ 7401-7642 (Supp. V 1981).
123. Pub. L. No. 96-510, 94 Stat. 2767 (1980) (codified at 42 U.S.C. §§ 9601-9615 (Supp. V 1981)). The "Superfund" is the popularized term for this legislation, but since there are several international pollution funds, a less confusing terminology would be "Environmental Response Act."
124. Pub. L. No. 95-217, 91 Stat. 1566 (1977) (codified as amended in various sections of 33 U.S.C. §§ 1251-1376 (Supp. V 1981)).
125. 7 U.S.C. §§ 136-136y (1976 & Supp. V 1981).
126. 29 U.S.C. §§ 651-678 (1976 & Supp. V 1981).
127. 42 U.S.C. §§ 300f-300j(10) (1976 & Supp. V 1981).
128. 49 U.S.C. §§ 1801-1812 (1976 & Supp. V 1981).
129. Pub. L. No. 89-234, 79 Stat. 903 (1965) (current version at 33 U.S.C. §§ 1251-1376 (1976 & Supp. V 1981)).

g. the Water Quality Improvement Act of 1970 (WQIA).[130]

While enacted with good intentions, the amount and scope of United States environmental legislation has sometimes resulted in overlapping jurisdiction and regulations. More frequently, the approach of regulating individual pollutants has created a confusing regulatory scheme. These problems have been exacerbated by definitional ambiguities and by a general lack of uniformity involving terminology. These problems are not entirely the fault of those attempting to regulate pollutants. In many instances, reliable scientific information is scanty. In addition, the nature and environmental impact of particular pollutants are often amorphous, which encourages overlapping regulations.

In 1983, the Chesapeake Bay situation became a forceful impetus for amending the FWPCA and the concomitant Clean Water Act of 1977. The continuing problems of the Bay demanded legislative action. This trend toward protecting and conserving the Bay's resources is the focus of the subsequent analysis.

3. Specialized United States Legislation: The Chesapeake Bay Region

Over twelve million United States citizens in five states rely directly or indirectly on the resources of the Chesapeake Bay.[131] An increasing awareness of the threat of pollution to the vitality of the Bay prompted congressional action during the mid-1970s. In 1975, the EPA was authorized to begin the Chesapeake Bay Program (CBP)[132] which was mandated: (1) to conduct research on the suspected problem areas involving nutrient enrichment, submerged aquatic vegetation, and high concentrations of organicides and toxic metals; (2) to develop an information base by identifying the Bay's living and nonliving resources, as well as its water quality; and (3) to design a management framework for short-term restoration and rehabilitation of the Bay (including deterrence of threatened injuries) and for long-term prevention and reconstruction.[133]

The CBP involved a five-year technical effort which began in 1976 and which was directed toward identifying and studying the pollutants and other factors threatening the environmental integrity of the Chesapeake Bay.[134] The technical program ended in 1981, and the scientific data and findings which had been generated were correlated during 1982 and 1983 into three EPA reports: (1) *Chesapeake Bay Program Technical Studies: A Synthesis*[135]

130. Pub. L. No. 91-224, 84 Stat. 91 (1970) (current version at 33 U.S.C. §§ 1251-1376 (1976 & Supp. V 1981)).

131. CHESAPEAKE BAY FINDINGS, *supra* note 48, at v.

132. Pub. L. No. 94-116 (1975).

133. CHESAPEAKE BAY FINDINGS, *supra* note 48, at v.

134. *Id.* at 1.

135. CHESAPEAKE SYNTHESIS, *supra* note 46.

(summarizing forty-five scientific studies); (2) *Chesapeake Bay: A Framework For Action;*[136] and (3) *Chesapeake Bay Program: Findings and Recommendations.*[137] During 1982, the EPA also made grants to provide continuity and to complete scientific research which was already in progress.[138] Significant progress was also made in September of 1982 when the EPA received $100,000 to implement the CBP.[139]

The next year, the Senate Committee on Environment and Public Works supported a total of "$14.5 million for the implementation of the management plan for the Chesapeake Bay and the development of such a plan for the Narragansett Bay."[140] The Senate Appropriations Subcommittee on Housing and Urban Development and Independent Agencies was asked to appropriate approximately $14.5 million as part of the 1984 EPA appropriations, because the EPA needed to establish a "Chesapeake Bay Liaison Office" and to add approximately five new positions to cope with the work load being generated.[141] Of the total funds to be committed, $10 million was specifically for the implementation of the CBP management plan for controlling water pollution, while $3 million was for research:

> to continue to assess the relationship between point and non-point source pollution and the impact of such pollution on water quality . . . [and] to do further research on the impact of pollutant loadings, particularly nutrients on the fisheries resources of the Bay. Special attention should be given to striped bass.[142]

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136. CHESAPEAKE FRAMEWORK, *supra* note 48.

137. CHESAPEAKE BAY FINDINGS, *supra* note 48. *See supra* notes 84-86 and accompanying text. *See* S. REP. No. 233, 98th Cong., 1st Sess. 13-14 (1983).

138. For example, ongoing support was provided to the Virginia State Water Control Board for its project entitled "Data Organization, Technical Support and Coordination for the EPA's Chesapeake Bay Program." The Board received a $100,000 award as a modification to a previous EPA grant of $733,393, which was initially funded in 1978. As its share, the Commonwealth of Virginia contributed $108,493, and the total project cost was estimated at $841,886. In addition, the EPA added $20,247 in 1982 to an earlier grant of $231,151 which supported the "Chesapeake Bay Circulation Water Quality Model" begun in 1980 by the Virginia Institute of Marine Science (VIMS) in Gloucester. An additional $13,258 was provided by VIMS, and the project was managed by Dr. Ching Seng Fang, Chairman of the VIMS Department of Physical Oceanography and Hydraulics.

139. Specifically, the 1982 EPA appropriations bill included $900,000 for the following purposes:

a. $400,000 for annual monitoring of the Bay's water quality;
b. $300,000 for operating the Chesapeake Bay Liaison Office, located in Annapolis, Maryland;
c. $125,000 for maintaining an abatement and control data base; and
d. $75,000 for encouraging public participation in the CBP.

140. S. REP. No. 115, 98th Cong., 1st Sess. 1 (1983) (to accompany S. 1288).

141. Letter from Senators Charles McC. Mathias Jr., Paul S. Sarbanes, Paul S. Trible Jr., and John W. Warner to Senator Jake Garn, Chairman, Senate Appropriations Subcommittee on Housing and Urban Development and Independent Agencies (June 7, 1983) (letter on file in office of Senator John W. Warner) [hereinafter cited as June 1983 Letter to Senator Garn].

142. *Id.*

Extramural funds of $1.2 million were also designated to support the following activities:

> a. *public participation* ($100,000)—to provide all users of the Bay with opportunities to continue their involvement in the decision making process relating to resources and water quality;[143]
> b. *estuarine resource sampling and Bay monitoring* ($500,000)—to investigate low oxygen conditions, especially in deep channel areas, and to clarify the resource and water quality implications of low oxygen content;[144]
> c. *evaluation and refinement of a model for the Bay's water quality* ($400,000)—to understand the interactions of various ecological processes and to explore the interface between nutrient loads and the Bay's low oxygen conditions and concomitant algae blooms;[145] and
> d. *establishment and operation of a centralized data center* ($200,000)—to assure "technology transfer" to the individual states, to provide scientific support data for continued model refinements and monitoring, and to establish a service for data evaluation.[146]

In September of 1983, the Senate Committee on Environment and Public Works reconfirmed its commitment to the requested $14.5 million and incorporated the previous suggestions into its program for amending the legislation embodied in the FWPCA and the Clean Water Act of 1977.[147] The $10 million was slated to be utilized by those states which committed themselves to implementing the "Chesapeake Bay interstate management plan,"[148] and to qualify for grants a state was required to demonstrate that it would:

> a) establish a committee to provide guidance on the development and implementation of management program;
>
> b) coordinate research and pollution abatement programs which address adverse water quality factors;
>
> c) establish methods for improving sampling data collection and a system for collecting, analyzing, storing and disseminating such data; and
>
> d) implement water quality managmenet [*sic*] practices within three years of enactment of clean water act amendments.[149]

143. *Id.*
144. *Id.*
145. *Id.*
146. *Id.*
147. S. REP. No. 233, 98th Cong., 1st Sess. 12 (1983).
148. *Id.*
149. *Id.*

The Committee also supported establishment of an "Office of Chesapeake Bay Programs" to provide continuity for federal and state efforts involving the old CBP. The $3 million requested was to be utilized for: "a) collecting, coordinating, and disseminating all research information concerning the environmental quality of the Bay, b) conducting research to identify the sources, quantity, and effects of sediment desposition [*sic*] on the Bay, [and] c) conducting research on the impacts of pollutant loadings on the Bay's water quality and biota."[150] These objectives closely parallel those which were utilized as supportive rationales for the original request mentioned earlier. As each individual state's program was approved, the remaining $1.5 million was to help offset each state's implementation costs.[151] The involvement of state water quality managers in the decision making process was also promoted to make future recommendations more realistic and foster state commitment to implementation strategies.[152] For fiscal year 1984, the Congress eventually appropriated the $4.5 million for the grant program and the Chesapeake Bay Liaison Office in Annapolis, Maryland.[153]

By 1984, the Reagan Administration had also decided to promote the CBP by supporting a provision of the proposed Clean Water Act Amendments of 1983 which would provide $10 million per year for four years as the federal share of the program to clean up the Bay.[154] President Reagan even mentioned his support for the CBP in his 1984 State of the Union speech.[155] In addition, the District of Columbia, Maryland, Pennsylvania, and Virginia were firmly committed to the Chesapeake Bay cleanup effort. The District of Columbia established a policy of controlling urban runoff as well as concomitant sewer overflows.[156] In addition, plans were formulated for expanding and upgrading its Blue Plains treatment plant.[157]

Maryland allocated $70 million to the cleanup effort by authorizing: (1) the establishment of a comprehensive storm water management program, (2) the development of improved management practices to conserve farmland, (3) an improved and upgraded system of treatment plants, (4) the vigilant enforcement of erosion and sediment control plans, and (5) an ambitious overall program to preserve land adjacent to tributaries.[158] With regard to

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150. *Id.*

151. *Id.* at 13.

152. *Id.*

153. Senator Warner Speech, *supra* note 2.

154. *Id.*

155. State of the Union 1984 Speech, *supra* note 1, at H145.

156. Letter from Senators John Heinz, Charles McC. Mathias Jr., Paul S. Sarbanes, Arlen Specter, Paul S. Trible Jr., and John W. Warner to Senator Jake Garn, Chairman, Senate Appropriations Subcommittee on Housing and Urban Development and Independent Agencies (May 9, 1984) (letter on file in office of Senator John W. Warner).

157. *Id.*

158. *Id.*

living resources in the Bay, Maryland funded not only fisheries research, but also hatcheries for striped bass and waterfowl.[159]

To curb the phosphates in treated sewage discharges, Pennsylvania had subsequently established an effective plan for the Susquehanna River. Since the Susquehanna River constitutes the largest source of fresh water entering the Bay, this program helped the Bay's water quality and reduced the amount of nutrients. More recently, Pennsylvania committed itself to controlling the nonpoint source pollution involving animal wastes in farm runoff.[160]

By 1984, Virginia's two-year contribution toward cleaning up the Bay was $13.3 million. Virginia's plan was directed at improving controls on point source pollution, identifying concentrations of organicides and toxic metals, and providing controls on nonpoint source pollution caused by both agricultural and urban runoff.[161]

During the same time period that the EPA 1984 appropriations were requested, the Senate Appropriations Subcommittee on Commerce, Justice, State, and Judiciary was asked to appropriate $1.75 million for the Bay's fisheries as part of the 1984 funds for the National Oceanic and Atmospheric Administration (NOAA).[162] The funds were to be utilized for the following purposes:

> a. *acquisition of data for the Chesapeake Bay Data Center* ($250,000)—to enter field research and data (relating to "oysters, striped bass, and other living resources") into a data base, and thereby to improve NOAA's analytical capabilities;[163]
> b. *development of a research exchange for the Chesapeake Bay* ($200,000)—to collate via computers important information on Bay-related scientific projects, investigation, research, and technical literature and to provide Bay-related research institutions with easy access to this information;[164]
> c. *development of monitoring capabilities* ($200,000)—to conduct short-term observations on the Bay's living resources and to coordinate long-term monitoring of the Bay by EPA, NOAA, Maryland, and Virginia;[165]
> d. *improvement of fisheries statistics* ($100,000)—to generate new information on the large Bay fisheries, to complement state attempts at managing the Bay, and to stimulate uniformity and adequacy;[166]

159. *Id.*
160. *Id.*
161. *Id.*
162. Letter from Senators Charles McC. Mathias Jr., Paul S. Sarbanes, Paul S. Trible Jr., and John W. Warner to Senator Paul Laxalt, Chairman, Senate Appropriations Subcommittee on Commerce, Justice, State and Judiciary (June 7, 1983) (letter on file in office of Senator John W. Warner) [hereinafter cited as June 1983 Letter to Senator Laxalt].
163. *Id.*
164. *Id.*
165. *Id.*
166. *Id.*

e. *knowledge of the ramifications of oxygen depletion* ($500,000)—to understand the interface between excess nutrients and the increasing oxygen depletion which is destroying or stressing oysters and other living resources;[167]

f. *maintenance of fisheries stocks* ($500,000)—to assess fisheries stocks and to promote an understanding of long-term trends regarding clams, crabs, oysters, shad, striped bass, and other living resources.[168]

Recognizing the budget restraints of the Subcommittee, an alternative suggestion consisted of funding only the first three proposals at $100,000 each.[169] Fortunately, there was another safeguard for providing interim maintenance of the CBP, and this safeguard consisted of the management program established by NOAA, Maryland, Pennsylvania, and Virginia under the Coastal Zone Management Act of 1972 (CZMA).[170] This management mechanism, which was already in place, consisted of the general coastal management plan under section 309 of the CZMA.[171] This CZMA funding scheme worked well for fiscal year 1984 and an additional $2.25 million was requested for fiscal year 1985.[172]

The previous categories were slightly modified, and the $2.25 million was to be allocated as follows:

a. continuation of the emergency study of striped bass ($400,000),
b. acquisition, analysis, and interpretation of data via the Chesapeake Bay Data Center ($250,000),
c. development of monitoring capabilities ($1,000,000),
d. improvement of fisheries statistics ($100,000), and
e. knowledge of the ramifications of oxygen depletion ($500,000).[173]

The second suggestion and the last two suggestions as well as their funding levels were the same as the request for the previous fiscal year. However, the striped bass situation had emerged as a new "emergency" problem which might constitute a caveat of an approaching "environmental threshold," and the objective of "developing monitoring capabilities" subsumed three of the

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167. *Id.*
168. *Id.*
169. *Id.*
170. 16 U.S.C. §§ 1451-1464 (1976 & Supp. V 1981).
171. *Id.* § 1455. Section 309 of CZMA, providing administrative grants for coastal zone management plans, was codified as 16 U.S.C. § 1455 (1976 & Supp. V 1981).
172. Letter from Senators John Heinz, Charles McC. Mathias Jr., Paul S. Sarbanes, Arlen Specter, Paul S. Trible Jr., and John W. Warner to Senator Paul Laxalt, Chairman, Senate Appropriations Subcommittee on Commerce, Justice, State and Judiciary (May 3, 1984) (letter on file in office of Senator John W. Warner) [hereinafter cited as May 1984 Letter to Senator Laxalt].
173. *Id.*

categories of the previous year—with a large $1,000,000 combined funding request.[174]

Throughout 1984, the congressional commitment to the Chesapeake Bay cleanup was mushrooming. When it was recognized that the combined Maryland/Virginia catch of striped bass decreased from approximately 8 million pounds in 1973 to 0.5 million pounds in 1983, a request for $2 million was made as part of the 1985 appropriations for the Department of the Interior (DOI) to involve the United States Fish and Wildlife Service in the Chesapeake Bay cleanup.[175] Since in some areas of the Bay over fifty percent of the sediment pollution was originating from nonpoint sources, the Department of Agriculture (DOA) was asked to create ten new positions for soil conservation concentrating on controlling nonpoint source pollution as part of a cooperative effort with EPA.[176] In addition, a $500,000 research program to be conducted by the Corps of Engineers (Corps) was requested for the purpose of investigating erosion in the Chesapeake Bay area, since Maryland was losing over 22 million tons of soil per year.[177]

By August of 1984, the Congress had firmly committed substantial funds to several of these proposals involving the Chesapeake Bay. The Congress approved the EPA's request for $10 million for a liaison office, support activities, and grants to the states. The request of $2.25 million for NOAA was more successful than anticipated, since the Congress approved a total of $2.3 million which included: (1) $1.5 million for resource assessments, DO studies, and the compilation of fishery statistics; (2) $500,000 for the emergency striped bass study; and (3) $300,000 for coordinating activities. There was also congressional approval of $100,000 (of the requested $500,000) for the Corps to begin a survey of the shore erosion taking place in the Chesapeake Bay. It also appeared as though there would be partial, but substantial, funding of the requested $2 million for financing the participation of the Fish and Wildlife Service in the cleanup effort for the Bay. The request for ten new positions for DOA experts to study soil conservation was continuing to gain congressional support.

In addition to increasing congressional support, another important measurement of progress was the recognition by different federal agencies that

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174. May 1984 Letter to Senator Laxalt, *supra* note 172.

175. Letter from Senators John Heinz, Charles McC. Mathias Jr., Paul S. Sarbanes, Arlen Specter, Paul S. Trible Jr., and John W. Warner to Senator James A. McClure, Chairman, Senate Appropriations Subcommittee on the Interior (May 9, 1984) (letter on file in office of Senator John W. Warner).

176. Letter from Senators John Heinz, Charles McC. Mathias Jr., Paul S. Sarbanes, Arlen Specter, Paul S. Trible Jr., and John W. Warner to Senator Thad Cochran, Chairman, Senate Appropriations Subcommittee on Agriculture and Related Agencies (May 9, 1984) (letter on file in office of Senator John W. Warner).

177. Letter from Senators John Heinz, Charles McC. Mathias Jr., Paul S. Sarbanes, Arlen Specter, Paul S. Trible Jr., and John W. Warner to Senator Mark Hatfield, Chairman, Senate Appropriations Subcommittee on Energy and Water Development (May 3, 1984) (letter on file in office of Senator John W. Warner), [hereinafter cited as May 1984 Letter to Senator Hatfield].

they needed to establish the parameters of their responsibilities regarding the Chesapeake Bay cleanup. Accordingly, a "memorandum of understanding" was drafted between any two agencies whose responsibilities might overlap. Some of the more notable memoranda were drafted between: (1) the EPA and the NOAA,[178] (2) the EPA and the DOA's Soil Conservation Service,[179] (3) the EPA and the Corps,[180] and (4) the EPA and the United States Geological Survey.[181]

On September 13, 1984, another positive development occurred when the EPA and the Department of Defense (DOD) entered into a "joint resolution" on the Chesapeake Bay.[182] The EPA was concerned about the large number of projects which had been developed by the DOD within the Chesapeake Bay area. Between 1974 and 1984, the DOD had spent over $180 million on more than 300 projects, and as of 1984, the DOD still had nineteen projects under construction (total cost estimates at $17 million) and another nineteen projects in the planning stages.[183] The joint resolution committed the DOD:

> a. to give priority consideration to financing studies for abating pollution in the Bay;
> b. to initiate (on a trial basis) environmental self-auditing at several DOD installations in the Bay area;
> c. to review the management practices in DOD projects for pollution abatement;
> d. to continue providing environmental information to the EPA and the individual states; and

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178. Draft Memorandum of Understanding Between the National Oceanic and Atmospheric Administration Estuarine Program Office and the Environmental Protection Agency's Chesapeake Bay Liaison Office (copy on file in office of Senator John W. Warner).

179. Draft Memorandum of Understanding Between the United States Environmental Protection Agency and the Soil Conservation Service Concerning the Chesapeake Bay (copy on file in office of Senator John W. Warner).

180. Draft Memorandum of Understanding Between the United States Army Corps of Engineers (COE) and the United States Environmental Protection Agency (EPA) (copy on file in office of Senator John W. Warner).

181. Draft Memorandum of Understanding Between the United States Geological Survey and the Environmental Protection Agency's Chesapeake Bay Liaison Office (copy on file in office of Senator John W. Warner).

182. Environmental Protection Agency/Department of Defense Chesapeake Bay Initiative: A Joint Resolution on Pollution Abatement in the Chesapeake Bay, September 13, 1984 (copy on file in offices of Secretary William D. Ruckelshaus and Caspar W. Weinberger) [hereinafter cited as EPA/DOD Resolution]; *see* Remarks by Secretary William D. Ruckelshaus at the Environmental Protection Agency/Department of Defense Joint Resolution Signing Ceremony, Sept. 13, 1984 (copy on file in office of Secretary William D. Ruckelshaus); Remarks by Secretary Caspar W. Weinberger at the Environmental Protection Agency/Department of Defense Joint Resolution Signing Ceremony, Sept. 13, 1984 (copy on file in office of Secretary Caspar W. Weinberger).

183. EPA/DOD Resolution, *supra* note 182, at 1.

e. to review its practices relating to land management with the goal of reducing soil erosion and nonpoint source pollution.[184]

Complementing these DOD responsibilities, the EPA obligated itself:

a. to issue or reissue (by September 30, 1985) all permits of the National Pollutant Discharge Elimination System (NPDES) which dealt with major federal installations located in the Bay area;
b. to audit annually the environmental compliance of all major DOD installations; and
c. to provide technical assistance and expertise for minimizing nonpoint source pollution and other water pollution caused by DOD activities.[185]

These various agreements fostered not only cooperation, but also efficiency, with regard to the different cleanup efforts being directed at the Chesapeake Bay.

One outcome of these activities, which had important impacts upon both the United States and international environmental movements, involved the recognition that nonpoint source pollution was a serious environmental threat which was capable of being identified and controlled. Prior to this general time frame, nonpoint source pollution had been considered to be unidentifiable, uncontrollable, and an incidental part of "natural" erosion, and therefore, nonpoint source pollution was theoretically incapable of being regulated. Fortunately, this widely held belief was slowly being discredited, and when Congress initiated the Nonpoint Source Pollution Management Act of 1983[186] a milestone was reached. This legislation was designed to be combined with two other proposals[187] to become the "Clean Water Act Amendments of 1983."[188]

D. Trends and Conditioning Factors

1. Congressional Trends

There is an increasing public awareness of the threat pollution poses to both individual countries and the international community. Even so, there are still many widely held misperceptions which need to be dispelled. Despite international public opinion to the contrary, the ocean, for example, does

184. *Id.* at 1-2.
185. *Id.* at 2.
186. S. 2006, 98th Cong., 1st Sess. (1983).
187. S. 431, 98th Cong., 1st Sess. (1983); S. 1288, 98th Cong., 1st Sess. (1983).
188. S. 1288, 98th Cong., 1st Sess. (1983). The Senate Committee on Environment and Public Works approved its primary clean water extension bill S. 431 on September 22, 1983 by a vote of 14 to 0. The nonpoint source pollution bill, S. 2006, was approved on October 26, 1983, by a Committee vote of 16 to 0. It is anticipated that both of these bills will be joined to S. 1288 on the Senate floor. Approved in May of 1983, S. 1288 is a "shell reauthorization" of the previous clean water legislation.

not have an unlimited capacity to receive pollution from land-based sources. Another common misperception is that ocean areas such as the Mediterranean Sea and the Chesapeake Bay will naturally clean themselves by flushing pollutants out to the ocean depths. In addition, it needs to be remembered that the coastal areas are vital and hypersensitive spawning grounds for marine life and that over ninety percent of the commercial catch of fish is "taken within 200 miles of land."[189] Therefore, land-based pollution which necessarily passes through or remains lodged in the sediments of the hypersensitive coastal areas is not disseminated proportionately throughout the ocean, but instead, it has a large and disproportionate impact on the 200 mile coastal zones which are essential to the vitality of marine life.

A welcome domestic and international trend is the evolving recognition that nonpoint source pollution is identifiable and controllable. A simple United States definition states that "[n]onpoint source pollution is runoff pollution."[190] As the 1972 FWPCA as amended has exerted "greater control over point sources of pollution, nonpoint sources . . . [have emerged] as the major impediment to attaining and maintaining water quality standards and achieving the goals and objectives of the Act in many water bodies."[191] In brief, the "interim water quality goal of achieving fishable, swimmable waters everywhere by July 1, 1983 was established in the 1972 Act."[192] While this goal has been achieved in some areas of the United States, this goal has not been reached nationwide.[193]

Nonpoint source pollution includes "urban runoff from roofs and paved areas, return flows from irrigated agricultural lands, runoff from lands disturbed by construction, forestry operations and agricultural practices, and uncollected runoff and seepage from mining areas."[194] Nonpoint source pollution contributes large amounts of organicides and toxic metals to United States waterways,[195] and it is "responsible for 49 to 76 percent of oxygen-demanding organic materials, 66 to 99 percent of suspended solids, 83 to 85 percent of dissolved solids, 80 to 92 percent of nitrogen, 42 to 94 percent of phosphorous, [and] up to 98 percent of the bacteria"[196] entering United States waters. The trend in the United States is to diminish and control these pollutants by periodically amending the FWPCA.

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189. Alexander & Hodgson, *The Impact of the 200-Mile Economic Zone on the Law of the Sea,* 12 SAN DIEGO L. REV. 569, 586 (1975).

190. S. REP. No. 282, 98th Cong., 1st Sess. 1 (1983).

191. *Id.* at 2.

192. S. REP. No. 233, 98th Cong., 1st Sess. 2 (1983); 33 U.S.C. § 1251(a)(2) (1976 & Supp. V 1981).

193. S. REP. No. 233, 98th Cong., 1st Sess. 2 (1983). "A Louis Harris poll conducted in December 1982 for the National Resources Council of America showed that 74 percent of the American people support the goal of achieving fishable swimmable waters." *Id.*

194. S. REP. No. 282, 98th Cong., 1st Sess. 1-2 (1983).

195. *Id.* at 2.

196. *Id.*

An interesting development which resulted from the improvement in water quality mandated under the FWPCA was a type of "reversed pollution impact." This problem resulted from a situation where the water quality in a given area improved and the living resources returned as the biological communities began to reestablish themselves. While the pollution trend in these areas was reversed, the consumption of fish and other living resources from these areas was still dangerous because of pollutants from the sediments becoming ingrained in the food chain[197]—a "reversed pollution impact" on the public. It was a disturbing development when it became necessary "to warn people against unlimited consumption of fish caught in these previously unpopulated water bodies."[198]

In 1983 and 1984, the potential congressional amendments to the FWPCA were designed to combat the aforementioned problems[199] and to achieve the designated goals.[200] The trend in Congress was to curb nonpoint source pollution by: (1) development of state programs, which included the identification and subsequent utilization of best management practices (BMPs);[201] (2) federal review and approval of state management programs;[202] (3) federal identification of the origins and problems associated with nonpoint source pollution;[203] and (4) grants for implementation of approved state management programs (as well as administrative funds for the EPA).[204]

Other conditioning factors impacting on the FWPCA included a congressional attempt to encourage faster implementation of the program to pretreat those industrial wastes which were discharged into publicly owned treatment works (POTWs) as mandated under the FWPCA.[205] However, since EPA Administrator William Ruckelshaus testified that the potential administrative demands upon the EPA would be substantially increased and that even then, the EPA could not guarantee the adequate and consistent removal of organicides and toxic metals, the old FWPCA requirements were left intact.[206] Attempts by the EPA to downgrade water quality standards were rejected[207] and control of toxic wastes was promoted.[208] The trend was to require the individual states to reduce toxic pollutant loads by: (1) identifying water bodies which would not meet water quality standards even after the imple-

197. *See* S. REP. No. 233, 98th Cong., 1st Sess. 3 (1983).
198. *Id.*
199. *See supra* notes 38-73 and accompanying text.
200. *See supra* notes 74-87 and accompanying text.
201. S. REP. No. 282, 98th Cong., 1st Sess. 5-9 (1983).
202. *Id.* at 9-10.
203. *Id.* at 10.
204. *Id.* at 10-12. For the complete legislative text of these proposals, see S. 2006, 98th Cong., 1st Sess. § 1 *et seq.* (1983).
205. S. REP. No. 233, 98th Cong., 1st Sess. 4 (1983).
206. *Id.* at 6.
207. *Id.*
208. *Id.* at 6-7.

mentation of best available technology (BAT) controls;[209] (2) adopting numerical criteria for "problem" pollutants as delimited by EPA water quality standards and biomonitoring techniques;[210] and (3) establishing effluent limitations.[211]

Another conditioning factor involved the ocean discharge waiver system which under the Clean Water Act Amendments of 1977 allowed municipalities discharging wastes into the ocean to obtain EPA waivers from the EPA's "uniform secondary effluent limitation requirement."[212] An increase in applications which probably did not conform with the congressional intent in allowing ocean waivers prompted the EPA to seek a tightening of the waiver requirements. The Senate Committee on Environment and Public Works agreed, and the Committee supported a proposal to require that all sources discharging wastes into POTWs were in compliance with the pretreatment requirements.[213] "Concern was also expressed for marine bays and estuaries which receive wastes from POTW's seeking waivers,"[214] because it was apparent that these "waters represent some of our most productive biological areas and deserve to be protected against degradation."[215] Accordingly, the Committee's intent was to ensure that marine waters receiving discharges did not receive significant amounts of effluents which had been previously discharged by POTWs.[216] Secondly, there was a prohibition of discharges into "stressed waters;" that is, waters not supporting a "balanced indigenous population," which was defined as a community reasonably "expected to occur in a given area absent pollution."[217]

Other congressional trends included encouraging the EPA to hasten the establishment of standards and a management program for sewage sludge.[218] The establishment of the Chesapeake Bay Program was also important, because it provided a vanguard mechanism for pollution research and management.[219] The success or failure of Chesapeake initiatives will have profound impacts upon the future of environmental efforts in the United States to curb nonpoint source pollution and to protect the ecologically sensitive coastal areas. As with any new program which is exploring new issue areas, some setbacks should be anticipated, but it is important to provide adequate funds for the Chesapeake initiatives since serendipitous

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209. *Id.* at 7.
210. *Id.*
211. *Id.*
212. *Id.* at 7-8.
213. *Id.* at 8.
214. *Id.* at 9.
215. *Id.*
216. *Id.*
217. *Id.*
218. *Id.* at 10-11.
219. *Id.* at 12-14. For the complete legislative text of these proposals, see S. 431, 98th Cong., 1st Sess. § 1 *et seq.* (1983).

benefits and new concepts for controlling pollution will probably be forthcoming. Other states need to heed and extrapolate from the initial Chesapeake Bay research which has already exposed a number of false assumptions including the myth that the Bay cleans itself.

2. Trends in the Chesapeake Bay Region

Between 1950 and 1980 the number of people living in the Chesapeake Basin area increased by 4.2 million, and by the year 2000 a further increase of 1.9 million people is predicted.[220] As a by-product of this population increase there has been increased urbanization, and while less than fifteen percent of the Basin region has been transformed into residential, urban, and suburban areas, this use of land has increased 182 percent since 1950.[221] During the same thirty years, cropland has decreased twenty-four percent, and pasture land has decreased a significant thirty-nine percent.[222] These figures are mitigated slightly by the fact that forest land has increased 3.5 percent.[223]

As of 1980, the Bay was edged by approximately 498,000 acres of wetlands.[224] These ecologically sensitive wetlands are necessary for the maintenance of marine life inside and outside the Bay. During the 1960s, several thousand acres of these wetlands were destroyed each year.[225] Fortunately, more stringent federal, state, and local regulations acting in concert with increased public and private conservation efforts have reduced "the loss of tidal wetlands to approximately 50 acres per year."[226] Other land-use trends involve changes in agricultural activities: (1) "conversion to conservation-tillage practices," which reduces erosion but usually involves the unfortunate by-product of increasing the use of organicides;[227] (2) "intensification of agricultural activity," which involves increased utilization of organicides and fertilizers;[228] and (3) "consolidation of agricultural lands," which often involves leases to tenant farmers who have "few incentives to reduce soil erosion and chemical loss, especially when there are high initial costs and slow pay-backs."[229] Particularly troublesome is the problem involving the newer agricultural technologies which are being utilized "to increase the efficiency and speed of soil preparation, crop maintenance, and harvesting

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220. CHESAPEAKE FRAMEWORK, *supra* note 48, at 10; CHESAPEAKE BAY FINDINGS, *supra* note 48, at 14.

221. CHESAPEAKE FRAMEWORK, *supra* note 48, at 10.

222. *Id.*

223. *Id.*

224. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 16.

225. *Id.*

226. *Id.*

227. *Id.* at 15.

228. *Id.*

229. *Id.* at 16.

. . . [since they] have led to abandonment of many of the basic conservation techniques."[230]

Water quality trends in the Bay include: (1) increased and detrimental nutrient enrichment,[231] (2) decreased dissolved oxygen (making much of the Bay's deep water anoxic and devoid of most life-forms except anaerobic bacteria),[232] and (3) increased concentrations of organicides and toxic metals.[233]

With regard to living resources, algal or dinoflagellate blooms have increased since 1950, and during this time frame, cell counts have apparently increased by a multiple of 250.[234] Simultaneously, submerged aquatic vegetation has decreased dramatically and there has been a parallel disappearance of the waterfowl which feed on SAV.[235] Even with more stringent pollution standards, the ability of the SAV to recover is uncertain.[236]

The shellfish and finfish of the Chesapeake Bay are also under stress. The most important commercial catches in the Bay include soft-shelled clams, blue crabs, oysters, and menhaden.[237] The Bay contributes more than fifty percent of the United States catch of soft-shelled clams, and the Bay is one of the world's largest producers of blue crabs—with an annual catch of approximately 55 million pounds.[238] The maintenance of the blue crab harvest at this level over the last fifteen years is one of the few laudable trends, but it should be noted that the blue crab harvest during the mid-1960s reached approximately 95 million pounds.[239] While averaging 27 million pounds of oyster meat per year during the last fifty years,[240] the oyster spat is obviously under stress, and gone forever are the days of harvesting 100 million pounds or more (as was generally the case during the last twenty years of the nineteenth century).[241] In any event, the harvest of Bay oysters in the early 1980s constituted 42.6 percent of the nation's total.[242]

"Striped bass, bluefish, white perch, shad, herring, and spot are other important commercial species landed in the Bay,"[243] and in 1980 the Maryland/Virginia dockside value of these species caught in the Bay was over $53 million.[244] Important shifts have been taking place involving the freshwater

230. *Id.* at 15.
231. CHESAPEAKE FRAMEWORK, *supra* note 48, at 16.
232. *Id.* at 17.
233. *Id.* at 17, 21-22.
234. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 21.
235. CHESAPEAKE FRAMEWORK, *supra* note 48, at 23.
236. *Id.*
237. *Id.* at 6.
238. *Id.* at 6, 26.
239. *Id.*
240. *Id.* at 6.
241. *Id.* at 26.
242. *Id.* at 6.
243. *Id.*
244. *Id.*

spawners, the saltwater spawners, and the estuarine forage fish. The freshwater spawners include alewife, catfish, shad, striped bass, white perch, and yellow perch.[245] The saltwater spawners consist of bluefish, croaker, menhaden, spot, and weakfish, while the estuarine foragers are Atlantic silverside, the Bay anchovy, and mummichog.[246]

From 1881 to 1890 marine spawners constituted seventy-five percent of the Bay's fisheries, but during the 1970s this percentage was ninety-six percent—indicating a dramatic change in the fisheries.[247] Catches of marine spawners such as bluefish and menhaden have generally remained stable or increased slightly. The catch of menhaden is the most notable since it increased from an average of approximately 200 million pounds before 1940 to an average 500 million pounds during the 1970s.[248] However, the freshwater spawners have decreased, and the "downward trend in American shad has been continuous since 1900, while declines in river herring and striped bass landings have been more recent."[249] In particular, the landings of striped bass have rapidly decreased since 1973,[250] and "[l]andings of alewife, shad, and yellow perch are now at unprecedented low levels."[251]

These trends may be a foreshadowing of future ecological problems:

> [T]he large relative increase in marine spawners and actual decline in freshwater spawners illustrate a gradual reduction in the diversity of Chesapeake Bay fisheries. . . . Such a loss of diversity can be viewed as potentially undesirable because harvests are more vulnerable to year-to-year fluctuations in population size of major commercial and recreational species. There is less resiliency (both economical and ecological) in single-species fisheries. The economic impacts of the failure of the California sardine, the Peruvian anchoveta, or the Delaware Bay menhaden fisheries are prime examples. Because freshwater-spawning fish and estuarine-spawning shellfish spend all or most of their sensitive life stages in the Bay, their well-being may be considered as an indication of the health of the estuary. Thus, the simultaneous declines in most of these species is reason for concern.[252]

Therefore, environmentalists are being warned by the declines in those living resources of the Bay which are the best indicators of approaching ecological

245. *Id.* at 27.

246. *Id.*

247. *Compare id., with* CHESAPEAKE BAY FINDINGS, *supra* note 48, at 21 (the dates associated with the change from 75 to 96% in the latter source are typographical errors).

248. CHESAPEAKE FRAMEWORK, *supra* note 48, at 28.

249. *Id.* at 27.

250. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 21.

251. CHESAPEAKE FRAMEWORK, *supra* note 48, at 27.

252. *Id.* at 27-28.

trouble. The extent of the current problem is difficult to gauge, and trying to predict the future by extrapolating from the trends of the 1970s (and the last 100 years) may be too speculative. However, the inescapable conclusion is that disturbing trends are occurring in the Bay, and more scientific information is needed to assist the development of effective countermeasures. In particular, research and monitoring should be focused on the disconcerting decreases in striped bass, since this species is evincing increased environmental stress and is closely linked to the vital ecological systems of the Bay.

E. Policy Alternatives and Recommendations

The EPA has made several recommendations for achieving its goals with regard to the Chesapeake Bay. To achieve the goal of restoring and maintaining the ecological integrity of the Bay, the EPA recommended that the Chesapeake Bay Program Management Committee be expanded to coordinate and implement CBP recommendations.[253] It was also decided that via the Committee structure, the states and the EPA should not only work through the existing management process for maintaining water quality (including the annual state certification process), but also develop a Basin-wide plan.[254]

To achieve the second EPA objective of delimiting an environmental quality classification scheme for the CBP and developing state water quality standards, a coordinated monitoring and research program was suggested.[255] The program was designed to include: (1) a long-term monitoring program which was both descriptive and analytical;[256] (2) a sustained program to establish the interface between living resources and the quality of both the Bay's sediments and water column;[257] and (3) efforts to identify, preserve, and restore important resource habitats.[258]

The EPA made two general recommendations "[t]o reduce point and nonpoint source nutrient loadings to attain nutrient and dissolved oxygen concentrations necessary to support the living resources of the bay."[259] Once again, the CBP Management Committee was to work through the existing process for managing water quality.[260] Secondly, the development and continual updating of a water quality model was suggested.[261] Specific recommendations regarding point source pollution provided that the states and the EPA should consider CBP findings and technical data when issuing permits under the National Pollutant Discharge Elimination System (NPDES),

253. *Id.* at Management Recommendations (no page numbers available).
254. *Id.*
255. CHESAPEAKE BAY FINDINGS, *supra* note 48, at 37.
256. *Id.*
257. *Id.*
258. *Id.*
259. *Id.* at 39.
260. *Id.*
261. *Id.*

enforcing NPDES permit limitations, and evaluating proposals for funding POTWs.[262] Phosphate in detergents was to be limited to 0.5 percent by weight, and administrative procedures were suggested.[263]

To combat nonpoint source pollution, the EPA recommended a regulatory and management program which was to be designed and incorporated into the Basin-wide plan.[264] Federal, state, and local agencies were: (1) to encourage reductions in agricultural nonpoint source pollution,[265] (2) to develop incentives prodding farmers to implement BMPs,[266] (3) to enforce existing programs for controlling urban and storm water runoff,[267] and (4) to strengthen laws protecting wetlands.[268]

The final EPA goal of controlling and monitoring both point and nonpoint sources of organicides and toxic metals was to be achieved by the CBP Management Committee, once again, working through the existing process for managing water quality.[269] To regulate point source pollution, the federal, state, and local authorities were to work through the Management Committee: (1) to use biomonitoring and chemical analyses to establish a GS/MS "fingerprint" and thereby to control pollutants via the NPDES permit program;[270] (2) to set and revise standards for toxic substances and water quality by utilizing CBP data;[271] (3) to enforce NPDES permits based on stringent state standards or EPA effluent guidelines;[272] (4) to strengthen pretreatment control programs to limit the discharge of toxic substances;[273] and (5) to reduce the use of chlorination and encourage the use of alternative biocides.[274]

Recommendations involving nonpoint source pollution from toxic substances centered on the utilization of CBP findings by federal, state, and local agencies. In particular, the Corps, the EPA, and the states were to consider CBP findings when developing conditions for issuing permits (such as, for dredge and fill operations).[275] Considering the potential abuses involving organicides as utilized in low-till agricultural practices, a Bay-wide effort to assure the proper application to organicides was suggested.[276] Urban runoff was to be controlled through continued research and monitoring

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262. *Id.*
263. *Id.* at 39-40.
264. *Id.* at 40.
265. *Id.* at 41.
266. *Id.* at 42.
267. *Id.*
268. *Id.*
269. *Id.* at 44.
270. *Id.*
271. *Id.* at 44-45.
272. *Id.* at 45.
273. *Id.*
274. *Id.*
275. *Id.* at 46.
276. *Id.*

programs.[277] Finally, there was an EPA recommendation for researching the magnitude and impacts of other nonpoint sources of toxic substances, including acid rain, land-based disposal sites, contaminated groundwater, acid mine drainage, and other incidental land-based pollution (such as anti-fouling paints and accidental spills).[278]

The congressional legislation and appropriations which would support these goals and help to implement these recommendations were outlined earlier.[279] In summary, these recommendations include:

a. continuing implementation of the CBP (at a funding level which is at least $10 million over the next 4 years);
b. maintaining the research of the CBP;
c. developing the Chesapeake Bay Liaison Office; and
d. supporting other extramural activities related to the CBP.[280]

The other EPA activities which relate to the CBP and which need to be supported can be subdivided into the following categories:

a. public participation;
b. estuarine resource sampling and Bay monitoring;
c. evaluation and refinement of a model for the Bay's water quality; and
d. establishment and operation of a centralized data center.[281]

While the precise funding levels which the EPA and other agencies will need to support these programs and activities will undoubtedly vary from year to year, the gravamen is that these recommended programs, research grants, and related activities should not only be initiated, but also funded and implemented. These EPA strategies are crucial to the continued ecological viability of the Chesapeake Bay, and as constituent parts of the environmental vanguard for analyzing United States coastal regions, they will assist the development of programs to protect the coastal resources of other areas of the country. For example, a "successful holistic strategy for the Bay on shore erosion can be transferred to other coastal regions in the United States."[282]

In addition to the recommendations to be implemented by the EPA, the NOAA should commit itself to the following:

a. continuation of the emergency study of striped bass;
b. acquisition, analysis, and interpretation of data for the Chesapeake Bay Data Center;
c. development of a research exchange for the Chesapeake Bay;

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277. *Id.*
278. *Id.*
279. *See supra* notes 131-88 and accompanying text.
280. *See* S. REP. No. 233, 98th Cong., 1st Sess. 12-13 (1983).
281. June 1983 Letter to Senator Garn, *supra* note 141.
282. May 1984 Letter to Senator Hatfield, *supra* note 177.

d. development of monitoring capabilities;
e. improvement of fisheries statistics (an extension of the striped bass recommendation);
f. knowledge of the ramifications of oxygen depletion; and
g. maintenance of fisheries stocks (an extension of the striped bass recommendation).[283]

To provide stability of expectations, at least the first four of these recommendations need to be supported and to be guaranteed continuity.

Similarly, the United States Fish and Wildlife Service at DOI needs to become further involved in the cleanup of the Chesapeake Bay, particularly with regard to the decreases in catches of striped bass and many of the Bay's other living resources. To combat nonpoint source pollution from the Chesapeake Basin's agricultural lands, the DOA should have a special group of personnel concentrating on soil conservation as part of a cooperative effort with the EPA. The Corps should also have the support necessary to investigate and develop control strategies for the erosion problem in the Chesapeake Basin.

State agencies and local governments dealing with the Chesapeake Bay problem areas have been given lead roles in developing the CBP and concomitant management strategies. Evidence of this trend was apparent in the EPA recommendation that the states should work through existing management schemes for controlling water quality. These state and local groups should continue to have maximum input and impact on the development of future strategies. This policy has been endorsed by the Senate Committee on Environment and Public Works.[284] Even so, the federal agencies have important functions which only they have the resources to perform. As they have done in the past, it is important that the federal, state, and local agencies continue to coordinate their efforts to assist in solving the problems of the Chesapeake Bay.

III. CONCLUSION

The Chesapeake Bay is in the vanguard of both United States and international environmental efforts. The Bay is a valuable United States asset which cannot be allowed to decline into irreversible despoliation, but more importantly, the Bay also serves as a symbol which is testing the commitment of federal, state, and local agencies to environmental quality. The progress accomplished under the CBP will be meaningless unless there is continued and constant commitment from all of the parties involved. A successful Bay cleanup program will take many years, continued efforts, and adequate funding.

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283. *See* May 1984 Letter to Senator Laxalt, *supra* note 172; June 1983 Letter to Senator Laxalt, *supra* note 162.

284. *See* S. REP. No. 233, 98th Cong., 1st Sess. 13 (1983).

While the short-term costs of cleaning the Chesapeake Bay may be high, the long-term costs of failing to regenerate the Bay will be higher. By initiating and continuing the cleanup process, more of the environmental costs will be internalized, not externalized. In addition, the Chesapeake Bay "commons" will be protected, and long-term economic and environmental costs will be reduced.

The alternative would be an affront to the public welfare. A few years ago, the American public was shocked to learn that Lake Erie was heavily polluted and dying. Fortunately, there was a ground swell of public support to reverse the pollution in Lake Erie, and the Lake has since made a comeback. The reversal of the pollution trends in Lake Erie did not occur quickly, and it should be remembered that the Lake was regenerated primarily by allowing it to wash its wastes out to sea. The initial research involving the circulation patterns in the Chesapeake Bay may be confirmed to reveal that the Chesapeake Bay does not or cannot wash its wastes out to sea. Accordingly, this option which was afforded to decision makers cleaning up Lake Erie is probably not available to decision makers trying to clean up the Chesapeake Bay.[285]

The need to begin the Bay's cleanup is immediate. The commitment to saving the Bay must also be maintained, or the spectre of an approaching "environmental threshold" might become a reality—signaling an irreversible environmental decline in the Bay.

285. *See* Senator Warner Speech, *supra* note 2. For the congressional action which was taken to clean up Lake Erie and maintain the Great Lakes, see 33 U.S.C. § 1258 (1976 & Supp. V 1981).