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Wastes, Water, and Wishful Thinking: The Battle of Lake Erie

Arnold W. Reitze, Jr.

Pollution may well be the nation's most broadly based and democratic effort.

Galbraith, *The Polipollutionists*, *Atlantic*, Jan. 1967, at 52, 54.

LAKE ERIE is in danger of becoming a marsh.¹ This potential danger may be realized within this century. "At the present rate of weed growth, Lake Erie will become a Sargasso Sea within the lives of our children; already a foot-deep mat of algae covers

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several hundred square miles of Erie."² Neither the results nor the transition would be pleasant — the marsh would be the nation's largest open sewer. Even without this catastrophic finale, if the present deterioration continues the water supply for our high density, industrialized society could be so impaired that further societal development would be precluded.

The primary agent responsible for this process is the phosphates which fertilize algae. The algae die, releasing the phosphate to fertilize more algae. Already one algae "bloom" has covered 800 square miles of Lake Erie. The "bloom" was a dense surface scum two feet thick with the appearance of split pea soup. In late summer substantial portions of the Lake can be found to have practically no oxygen in the lower depths. The absence of oxygen means essentially the absence of life. Details on this and other aspects of Lake Erie's pollution, plus an account of what very little has been done and what can be done to halt it, are the substance of this study.

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¹ *Lake Erie Dying but not Dead*, 1 ENVIRONMENTAL SCIENCE AND TECHNOLOGY 212 (March 1967); Powers & Robertson, *The Aging Great Lakes*, SCIENTIFIC AM., Nov. 1966, at 95.

² Woodbury, *Sewage gushes on, but something is being done*, LIFE, Aug. 23, 1968, at 46.

I. DEFINING THE PROBLEM

Twenty percent of the world's supply of fresh surface water is contained in the Great Lakes Basin.³ Most of this water is being contaminated from numerous pollution sources. Lake Erie, shallowest of the Great Lakes⁴ and surrounded by large urban areas, is threatened the most seriously. More than 3,200,000 persons are dependent on Lake Erie for drinking water; about two-thirds of these persons are residents of Ohio. The Lake supplies 619 million gallons of water daily for household use. It supplies another 4.7 billion gallons each day for industrial use.⁵ Like sunlight and rain, this water has been very largely taken for granted.

Lake Erie, as with most polluted bodies of water,⁶ is not subjected to a homogeneous input of deleterious pollutants.⁷ Rather, the Lake is the recipient of a variety of pollutants. This is of patent relevance for the effect on a body of water as well as the appropriate control mechanism is dependent upon the type of pollutant being released. The various pollutants, however, must also be considered in totality as the synergistic effect of these inputs requires a comprehensive abatement program. Most pollutants which affect Lake Erie fall into nine categories: (1) infectious agents; (2) chemical fertilizers (including those not designed for this purpose, such as detergent phosphates); (3) chemical and mineral wastes from industry; (4) organic chemicals — especially

³ F. GRAHAM, JR., *DISASTER BY DEFAULT* 136 (1966); LEAGUE OF WOMEN VOTERS, *LAKE ERIE BASIN COMMITTEE, LAKE ERIE REQUIEM OR REPRIEVE?* 16 (1966); Hill, *The Great and Dirty Lakes*, *SATURDAY REV.*, Oct. 23, 1965, at 40.

⁴ In terms of surface area, Lake Erie ranks fourth out of the five Great Lakes. Only 12 freshwater lakes in the world are larger. Lake Erie is the smallest of the Great Lakes in volume storing only 2 percent of the total water in the Great Lakes. U.S. DEP'T OF INTERIOR, *FEDERAL WATER POLLUTION CONTROL ADMINISTRATION (FWPCA) LAKE ERIE ENVIRONMENTAL SUMMARY 1963-1964*, at 1 (1968).

⁵ *Cleveland: Saving Lake Erie*, *SATURDAY REV.*, October 1965, at 40. U.S. DEP'T OF INTERIOR, *FWPCA LAKE ERIE REPORT: A PLAN FOR WATER POLLUTION CONTROL* 27 (Aug. 1968) [hereinafter cited as *LAKE ERIE REPORT*], stated that in 1960 nearly 10 million persons lived in the United States portion of the Lake Erie Basin and 1.2 million in the Canadian portion. Lake Erie and its headwaters, the Detroit River, now supply 87 percent or 1,190 million gallons per day (mgd) of the population's water need (municipal water supply).

⁶ For a discussion of some of the pollution problems facing American waters but not particularly found in the Lake Erie Basin, see LEAGUE OF WOMEN VOTERS, *THE BIG WATER FIGHT* 34 (1966); J. WRIGHT, *THE COMING WATER FAMINE* (1966); *Blighted Lakes*, *LIFE*, Aug. 23, 1968, at 37.

⁷ *LAKE ERIE REPORT*, *supra* note 5, at 31. These pollutant inputs come from three geographical areas. "These areas in order of decreasing effect on the overall quality of Lake Erie water are (1) Detroit, Michigan, and its surrounding municipalities, (2) the Greater Cleveland-Akron area, and (3) the Maumee River basin area." *Id.* at 4. For details as to the persons responsible for these pollutants, see *id.* at 87-107 (Appendix).

insecticides, pesticides, and herbicides; (5) silt from erosion; (6) heat from using water as a coolant such as in electric generating plants; (7) petroleum pollutants; (8) lead poisons — from car fumes; and (9) gross matter — the solid trash and debris deposited in our waters or dumped on the shores and later washed into the water. A tenth category — radioactive substances — can become important if proposed nuclear powered generating plants are built and if atmospheric testing of atomic weapons is resumed. We will examine each of these categories of pollutants in turn.⁸

II. SOURCES OF POLLUTANTS

A. *Infectious Agents*

More than a billion dollars has been spent in Ohio in the past 14 years for public sewerage and wastewater treatment works,⁹ yet

[t]he lower Cuyahoga River and navigation channel throughout the Cleveland area is a waste treatment lagoon. At times, the river is choked with debris, oils, scums, and floating globs of organic sludges. Foul smelling gases can be seen rising from decomposing materials on the river's bottom. Viewed from the city's observation towers, the river appears to be chocolate-brown or rust colored. During most of the year this lower section has no visible life, not even low forms such as leeches and sludgeworms, which usually thrive on wastes.¹⁰

(1) *Inadequate Treatment Facilities.* — The pollution of Lake Erie from infectious agents continues. The primary source of this pollution is inadequately treated wastes from municipal and sewage dis-

⁸ These categories are similar to the broad classifications used in the NATIONAL RESEARCH COUNCIL COMM., NATIONAL ACADEMY OF SCIENCES, WASTE MANAGEMENT AND CONTROL, No. 1400, at 12 (1966) [hereinafter cited as WASTE MANAGEMENT].

⁹ OHIO DEP'T OF HEALTH, OHIO WATER POLLUTION CONTROL BOARD (OWPCB), CLEAN WATERS FOR OHIO 12 (Summer ed. 1966).

¹⁰ Statement of George Harlow, Director, Lake Erie Program Office, FWPCA, *Hearings on Water Quality Criteria for the Rocky, Cuyahoga, Chagrin, and Grand River Basins and their Tributaries Before OWPCB* 3 (May 22, 1968).

Merely because the Cuyahoga River can no longer support even sludge worms does not mean that these creatures are not increasing in other parts of the Lake. The FWPCA reported:

Bottom organisms in ever-widening places are changing or have changed from a wide variety with relatively few numbers to a narrow hardy variety with very high populations. Tremendous numbers of sludgeworms (up to 30,000 or more per square yard) now inhabit bottom areas which not long ago were dominated by mayflies and other pollution-sensitive invertebrates in numbers two orders [*sic*] of magnitude lower. In the western basin the area dominated by sludgeworms has increased more than 10 times since 1930. LAKE ERIE REPORT, *supra* note 5, at 33.

strict treatment plants. A second source, though much less significant, is the untreated wastes dumped from boats.¹¹ The Cuyahoga River at its mouth is the most polluted water in the Erie Basin.¹² Its coliform densities range from 560,000 to 1,200,000.¹³ This latter figure is 1200 times greater than the maximum bacteria count allowed for water to be deemed safe for swimming. The most visible effect of this infectious pollution is that only three beaches on Lake Erie are today considered unquestionably safe for swimming.¹⁴

Now with only three totally safe beaches left, the destruction of our water supply will be next.¹⁵ Chagrin Falls, a wealthy execu-

¹¹ See generally OHIO DEP'T OF HEALTH, DIVISION OF ENGINEERING, REPORT AND RECOMMENDATIONS ON WATER QUALITY FOR THE ROCKY, CUYAHOGA, CHAGRIN, AND GRAND RIVERS AND THEIR TRIBUTARIES (May 1968) [hereinafter cited as OHIO DEP'T HEALTH]; ERIE, PENNSYLVANIA, COUNTY COMMISSIONER, ERIELAND-2000, ENVIRONMENTAL HEALTH SURVEY REPORT (1967) [hereinafter cited as ERIELAND]; MICH. DEP'T OF CONSERVATION, WATER RESOURCE USE PRESENT AND PROSPECTIVE FOR ST. CLAIR RIVER—LAKE ST. CLAIR—DETROIT RIVER—LAKE ERIE—MAUMEE RIVER BASIN AND WATER QUALITY STANDARDS AND PLAN OF IMPLEMENTATION (Mich. Water Resources Comm'n June 1967) [hereinafter cited as MICH. DEP'T OF CONSERVATION].

¹² "Sometimes the old river seems to be a combination of one-third mud from the still rural headwaters, one-third sludge, and one-third pickle liquor from the great mills . . ." W. ELLIS, *THE CUYAHOGA 2* (1966). The Cuyahoga may not be the most polluted river in the Basin. This dubious honor may go to the Buffalo River which

is a repulsive holding basin for industrial and municipal wastes under the prevalent sluggish flow conditions. It is devoid of oxygen and almost sterile. Oil, phenols, color, oxygen-demanding materials, iron, acid, sewage, and exotic organic compounds are present in large amounts. . . . Thick films of oil are present on the Buffalo River at all times except during flood conditions. In addition to upstream sources, oil is discharged directly to the river by Mobile Oil, Republic Steel, and Donner-Hanna Coke. LAKE ERIE REPORT, supra note 5, at 50 (emphasis in original).

However, the city of Detroit, Michigan, is the largest single contributor of municipal waste, contributing 64.4 percent of the total oxygen demanding wastes but to a tributary with a much larger volume of flowing water. *Id.* at 53.

¹³ U.S. DEP'T OF INTERIOR, *supra* note 4, at 56. There is little reason to believe these figures have changed, since FWPCA 1968 figures for Lake Erie near the Cuyahoga show near consistency for 1965, 1966, and 1967. The report in OHIO DEP'T OF HEALTH, *supra* note 9, at 71 (Table 6), is also consistent.

¹⁴ The three beaches are Cedar Point, Ohio; Presque Isle State Beaches, Pennsylvania; and Beaver Island State Park, New York. U.S. DEP'T OF INTERIOR, FWPCA, LAKE ERIE BATHING BEACH WATER QUALITY (June 1968). "Approximately one-third of the United States Lake Erie shoreline is either continuously or intermittently fouled by bacterial contamination." LAKE ERIE REPORT, *supra* note 5, at 35.

¹⁵ The Public Health Service has advised ship captains on Lake Erie not to take on drinking or cooking water from partially polluted waters up to 20 miles from shore. N.Y. Times, Jan. 2, 1968 (city ed.).

Extensive treatment must now be provided to Erie's raw water supply to prevent severe finished water taste and odor problems caused by the waste from the Hammer-mill Paper Co. LAKE ERIE REPORT, *supra* note 5, at 48.

tive bedroom of Cleveland, detracts from the water quality of the Chagrin River with its inadequately treated effluent.¹⁶ Nineteen independent treatment plants on the Rocky River provide inadequate treatment.¹⁷ The Ohio Division of Engineering lists 70 municipal and sewage district plants in the Chagrin, Cuyahoga, Rocky, and Grand River basins as being inadequate.¹⁸ In greater Cleveland there are still some small communities with no waste treatment. Almost as bad are the few communities with only primary treatment.¹⁹ As the total discharge of communities continues to rise, primary treatment alone does not provide significant pollution reduction.²⁰

The failure to provide adequate municipal sewage treatment is almost entirely due to a lack of community interest in abating its harmful waste discharges, for there are no technological problems to prevent at least secondary treatment, removing 80 percent of the biological oxygen demanding wastes.^{20a} The high coliform

¹⁶ Statement of George Harlow, *supra* note 10, at 4.

¹⁷ *Id.* at 1.

¹⁸ OHIO DEP'T HEALTH, *supra* note 11, Tables 3 A & 3 D.

¹⁹ *Id.*

Approximately 9 million people inhabit communities within the U.S. portion of the Lake Erie basin, discharging partially treated wastes directly into Lake Erie or into its tributaries. Nearly 2 million more people are served by septic tanks. Sixty-three municipal primary treatment plants serve approximately 5 million people, discharging 879 mgd of wastes; and 155 municipal secondary treatment plants serve approximately 4 million people, discharging 591 mgd of wastes. LAKE ERIE REPORT, *supra* note 5, at 53.

²⁰ *Id.* Primary sewage treatment generally has but one function: to remove suspended solids. This is accomplished in a settling tank, a process which removes about 35 percent of the organic pollutants. Thus, with primary treatment, each 100 gallons of treated sewage is equivalent in organic pollutants to 65 gallons of raw sewage. See generally H. BABBITT & E. BAUMANN, SEWERAGE AND SEWAGE TREATMENT (8th ed. 1965); V. EHLERS & S. STEBL, MUNICIPAL AND RURAL SANITATION (6th ed. 1965). The FWPCA stated that:

The Lake Erie basin should be served now by treatment resulting in a minimum of 85 percent removal of BOD, substantially complete removal of suspended solids, and 92 percent removal of total phosphorus. By 1990 tertiary treatment should be a general basin-wide requirement. LAKE ERIE REPORT, supra note 5, at 72 (emphasis in the original).

^{20a} Theoretical efficiency is higher but problems incurred in the operation of the plant reduce the percentage of biological oxygen demanding waste (BOD) removal. One of the reasons most often given for this low efficiency is lack of adequately trained manpower. Some engineers say normal operations for many plants is even lower than any figures produced as poor practices are somewhat ameliorated when tests are being made to produce publishable data. For a discussion of this problem, see U.S. DEP'T OF INTERIOR, FWPCA, MANPOWER AND TRAINING NEEDS IN WATER POLLUTION CONTROL, S. Doc. No. 49, 90th Cong., 1st Sess. (1967).

Some of the oxygen loss in Lake Erie results from the fact that efforts to reduce pollution by means of modern sewage treatment plants have been ineffective; in alleviating one part of the pollution problem, another has gone

bacteria count found in many of Lake Erie's tributaries can further be attributed to the lack of disinfection by the major municipal wastewater treatment facilities.²¹

Since there are those communities with little or no treatment and many communities with inadequate secondary treatment, or overflow bypass devices, there are very few communities in the Lake Erie basin providing adequate sewage treatment.²² The Detroit River with 92 percent of the flow of water into Lake Erie is the chief contributor of wastes to the Lake.²³ The Cleveland area is the second largest polluter.²⁴ Governmental units with jurisdiction over these sewage contributors have made significant efforts in the past three years to reduce pollution. But, because of the increased population and increased waste generated per capita, combined with an archaic and inadequate system of waste disposal, these efforts have only succeeded in forestalling an increase in the amount of pollutants flowing into the Lake and its tributaries, rather than actually improving the situation.

The problems we face in trying to clean up Lake Erie and the concomitant cost are due to centuries of indifference. In the 19th century the citizens of this country generally considered their water and other natural resources as inexhaustible. By the middle of

unabated. Sewage treatment plants, by microbial oxidation, convert organic waste matter to inorganic substance. It has been assumed that these inorganic products of sewage ideally relieved of biochemical oxygen demand (BOD) or organic wastes could be released to Lake Erie without causing any drain on the oxygen resources of the lake. Experience has proven this assumption to be incorrect. Adequate treatment of organic wastes, however, does eliminate most of the immediate oxygen demand which if not removed would be even more destructive.

The total mass of organic waste that reaches Lake Erie each year requires for its conversion to inorganic substances the consumption of about 540 million pounds of oxygen. The recent oxygen losses in the lake can only be partially explained by the action involved in oxidizing organic wastes dumped into the lake. For example, now the oxygen deficit in the bottom waters of the central basin (only 1/9 of the total lake volume) amounts to some 670 million pounds during the summer months. LAKE ERIE REPORT, *supra* note 5, at 34.

²¹ OHIO DEP'T HEALTH, *supra* note 11, at 27. See generally Rhine, *The Fundamental Principles of Sewage Chlorination*, WATER & SEWAGE WORKS, March 1966. See generally U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, SOLID WASTE/DISEASE RELATIONSHIPS: A LITERATURE SURVEY (1967), which contains information concerning the disease potential of wastes.

²² OHIO DEP'T HEALTH, *supra* note 11, Table 3.

²³ This percentage is often cited by Ohio officially to disclaim responsibility for the condition of Lake Erie. See, e.g., OWPCB, SPECIAL REPORT, OHIO TAKES LEAD IN POLLUTION FIGHT (June 1966).

²⁴ Cleveland, however, contributes only 9 percent of the total municipal wasteload entering Lake Erie compared to Detroit's 64.4 percent. LAKE ERIE REPORT, *supra* note 5, at 53.

the 19th century basic water treatment technology was known and the empirical relationship between disease and water supply was recognized even though this preceded general acceptance of the germ theory of disease. Nevertheless, not even imminent death from typhoid fever, cholera, or lead poisoning from water pipes induced Americans to spend money to treat either their water supply or their sewage.²⁵ Surveys between 1913 and 1925 showed that nearly 90 percent of all cities in the United States dumped their sewage untreated into nearby streams.²⁶ Except for the "make work" projects of the Great Depression, the sanitary facilities in the United States have never kept pace with the need. With World War II, construction of water purification facilities virtually ceased, and after the war the prevailing government attitude returned to the "do nothing" approach of the 1920's.²⁷

This heritage of inaction and callous disregard for our water resources meant that in 1965, when federal enforcement goals first were proclaimed, the municipal sewage treatment standards were so low that sustained effort was found necessary simply to bring treatment up to the best standards of 50 years ago.^{27a} Despite this, a great deal of government pressure was and still is necessary to force many municipalities to do anything.²⁸ An example of this lack of civic responsibility is that of Silver Creek, New York. Since 1908 that small town, with a population of 3300, was under continuous orders to build a sewerage system.²⁹ However, it was not until 1966 that construction was finally underway.³⁰ This followed successful legal action by the state which in turn was

²⁵ E. MURPHY, *WATER PURITY* 29-40 (1961). In Ohio the City of Canton built the first municipal sewage treatment plant in the state in 1893. Oberlin, Alliance, and Clyde were the only other towns to have any sewage treatment prior to 1900. OWPCB, *CLEAN WATERS FOR OHIO* 17 (Spring 1968).

²⁶ E. MURPHY, *supra* note 25, at 87.

²⁷ *Id.* at 88.

^{27a} For these revised conclusions and recommendations of the conferees, see *LAKE ERIE REPORT*, *supra* note 5, at 69.

²⁸ It is difficult to imagine how modern Americans can simply dump raw sewage into water courses which are used in many cases by their downstream neighbors as a water supply. One reason may be that our puritanical heritage places such a veil of secrecy around the problem that many citizens do not even know what happens to their used water. In addition, since sewers are underground, political leaders can get little benefit by building sewer systems as monuments to themselves or to their mothers. Finally, benefits and costs are not mutual; one need not foul his own nest when he can send his residue to his neighbor's water supply.

²⁹ Northington, *Is Lake Erie Dying?*, *SIERRA CLUB BULL.*, Nov. 1965, at 3.

³⁰ U.S. DEP'T OF INTERIOR, FWPCA, *THIRD MEETING, IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES* 541 (June 22, 1966).

being pressured by the Federal Water Pollution Control Administration (FWPCA). By 1967 such facilities were 85 percent complete.³¹ This type of situation is being repeated widely as many villages and cities are forced for the first time to install sanitation facilities, reflecting the fact that modern America is slowly ascending to a sanitary level equal to that found in ancient Rome.³²

In 1965, Lake Erie's most serious source of pollution was the water entering the Lake via the Detroit River. Detroit had only primary treatment thus allowing the Lake to face a tremendous pollution load at its source. From Michigan flowed the sewage of an unsewered population of 212,700. A total of 3,381,500 persons had only primary treatment; while only 253,600 people had a secondary treatment.³³ Today, after 3 years of construction, the City of Detroit has improved facilities but still discharges waste from the Jefferson Avenue Treatment Plant, which contain solids, nutrients, dissolved organic substances, phenols, oils, coliform organisms, and other sewage wastes, into the Detroit River.³⁴ Because of this and many other sources of continuing pollution, the Michigan waters of Lake Erie were as polluted in 1967 as they had been at the inception of the program.³⁵

³¹ U.S. DEP'T OF INTERIOR, FWPCA, THIRD SESSION, 2 CONFERENCE PROCEEDINGS, POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES 306 (March 22, 1967).

"In the New York area of the Lake Erie basin, the wastes from only 39 percent of the total population receive secondary treatment." LAKE ERIE REPORT, *supra* note 5, at 55 (emphasis in the original).

³² However, despite a remarkable sewage system, Rome at the height of its power was filthy and overcrowded with more than a million people on slightly over 8000 acres. Kahn, *On the Brink of Chaos*, SATURDAY EVENING POST, Feb. 16, 1968, at 31. See also D. CARR, DEATH OF THE SWEET WATERS (1966); M. COHN, SEWERS FOR GROWING AMERICA 36 (1966).

³³ U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES 137 (Aug. 1965). "[Today]. . . 85 percent of the Southeastern Michigan population discharges wastes to sewers, [and] the wastes from only 10 percent of the total population receive secondary treatment. Southeast Michigan accounts for 58 percent of the entire municipal waste flow to the Lake Erie basin." LAKE ERIE REPORT, *supra* note 5, at 55 (emphasis in the original).

³⁴ MICH. DEP'T OF CONSERVATION, *supra* note 11, at 110. Detroit still does not have secondary treatment and present abatement schedules do not call for such facilities to be completed before November 1970. LAKE ERIE REPORT, *supra* note 5, at 88. Detroit is the largest municipal polluter in the basin contributing more wastes than all the other cities combined. *Id.* at 53.

The City of Detroit's main sewage treatment plant, serving more than 90 percent of the people in the Detroit area, contributes 95 percent of the municipal waste to the Detroit River and is the largest source of phosphorus, suspended solids, phenols, oil, inorganic nitrogen, and biochemical oxygen demand material in the entire Lake Erie basin. *Id.* at 39-40 (emphasis in original).

³⁵ Statement of Grover Cook, Chief of Enforcement, U.S. DEP'T OF INTERIOR, FWPCA, THIRD SESSION, 1 CONFERENCE PROCEEDINGS, POLLUTION OF LAKE ERIE

(2) *Inadequate Sewage Systems.* — Poor sewer planning is increasing the cost of developing a modern sewage treatment system due to the problem of combined sewers. The combined sewer is one that carries both sanitary wastes and storm water runoff in a single pipe. No one is certain why this practice developed. One theory is that it developed surreptitiously or at least without official approval as citizens at their own expense connected their homes to municipal storm drains.³⁶ The result is that one-half of the large cities and 25 percent of the 11,400 sewerred communities in the United States have combined sewers.³⁷ When heavy rains occur, the treatment plants cannot handle the increased flow, and the sewage exits through escape openings in the sewers to flow into open bodies of water such as Lake Erie.^{37a}

In the Cleveland area the sewage of suburban communities with separate systems flows into Cleveland's combined system, thereby eliminating the benefits of the separate sewer system.³⁸ In 1965 the Ohio Department of Health banned construction of com-

AND ITS TRIBUTARIES 33 (Mar. 22, 1967) (Buffalo, N.Y.) [hereinafter cited as CONFERENCE PROCEEDINGS].

In the Greater Cleveland area, the Ohio Department of Health has found inadequate waste treatment facilities in all four of its watersheds — Grand, Chagrin, Cuyahoga, and Rocky Rivers. See generally OHIO DEP'T HEALTH, *supra* note 11, Tables 3A-3D. The FWPCA has stated: "The inadequately treated wastes from the Cleveland Southerly Treatment Plant, and an undetermined number of storm water overflows and sewage bypasses, discharge tremendous quantities of oxygen demanding wastes and bacterial contamination, including numerous species of enteric pathogens, to the river." Statement of George L. Harlow, *supra* note 10, at 3.

In Erie County, Pennsylvania, 18 percent of the population is without public sewers; this sewage pollutes the waters of that state. ERIELAND, *supra* note 11.

³⁶ M. COHN, *supra* note 32, at 46.

³⁷ Weibel, Weidner, Christianson & Anderson, *Characterization, Treatment, and Disposal of Urban Stormwater*, in THIRD INTERNATIONAL CONFERENCE ON WATER POLLUTION RESEARCH, No. 15, at 1 (1966).

^{37a} Large quantities of municipal wastes without any treatment enter the streams in the Lake Erie basin via combined sanitary and storm water sewers. The amount is estimated at 40 billion gallons yearly. The yearly average strength of the wastes discharged from these sewer systems is estimated to be equivalent to the oxygen demand of raw sewage from a population of 615,000. LAKE ERIE REPORT, *supra* note 5, at 7.

Many of the systems are in such poor condition that sewage is continuously bypassed; Cleveland's system is a prime example.

At present the largest contributors to Lake Erie pollution from combined sewers are the cities of Detroit, Cleveland, and Toledo. These have an immediate detrimental effect, particularly at bathing beaches in the vicinity. Combined sewers are the main reason that the entire shoreline in the Cleveland metropolitan area is unsafe for swimming. *Id.* at 56-57.

³⁸ To partially relieve the overloaded sewers and to prevent the by-passing of raw sewage, the city has proposed the construction of express sewers (estimated cost \$20 million) directly to the treatment plants from areas served by separate sewers. LAKE ERIE REPORT, *supra* note 5, at 77.

bined sewers.³⁹ However, the replacement of combined systems with separate sewer systems would be prohibitively expensive, costing an estimated \$30 billion or more nationally.⁴⁰ Yet, even with a separate system, storm sewers will not discharge pure water unless the substance flowing in those sewers is treated. Every storm flushes sludge from the sewers, silt, oil and other chemicals from roads, etc. into storm sewers. Plans that do not call for the treatment of both storm and sanitary wastes are unsatisfactory, though, perhaps treatment of only the first flush of storm water will be necessary.⁴¹

The high cost of rebuilding existing sewers and the problems of having to treat the contaminated rain water runoff necessitates development of new modes of sewage disposal. Some techniques being investigated are putting small sewer pipe within an existing pipe, constructing large detention basins (proposed for Cleveland), digging deeper basins than previously thought possible, and building deep underground temporary storage facilities.⁴²

(3) *Vessels on the Great Lakes.*— The other source of infectious waste contamination is from the many boats that use Lake Erie's waters. Nationally, vessels discharge sewage into waters of the United States at a rate equivalent to that of an unsewered population of 500,000 people.⁴³ Commercial watercraft on the Great Lakes discharge sewage equivalent to that of 6000 people.⁴⁴ Government owned ships also contribute.⁴⁵ At the west end of Lake Erie, in Michigan waters, the waste discharge is equivalent to a population of 500, rising to 2700 on weekends in warm weather.⁴⁶ Ohio prohibits the use of marine toilets except on the Ohio River,

³⁹ U.S. DEP'T OF INTERIOR, *supra* note 30, at 210. The FWPCA calls for the elimination of all pollution from combined sewer overflows by 1980. LAKE ERIE REPORT, *supra* note 5, at 14.

⁴⁰ *Man an Endangered Species?*, U.S. DEP'T OF INTERIOR YEARBOOK, No. 4, at 64 (1967). In the Lake Erie Basin, it is estimated that some \$3 billion would have to be spent to convert present combined systems to separate systems. LAKE ERIE REPORT, *supra* note 5, at 86.

⁴¹ U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, POLLUTION EFFECTS OF STORMWATER AND OVERFLOWS FROM COMBINED SEWER SYSTEMS (Public Health Service Pub. No. 1246, 1964).

⁴² U.S. DEP'T OF INTERIOR YEARBOOK, *supra* note 40, at 65.

⁴³ U.S. DEP'T OF INTERIOR, WASTES FROM WATERCRAFT, S. Doc. No. 48, 90th Cong., 1st Sess. 3 (1967). The figures given in the *Lake Erie Report*, *supra* note 5, at 57, are somewhat inconsistent with the above; the report's figures seem erroneous.

⁴⁴ *Id.* at 11.

⁴⁵ *Id.*

⁴⁶ LEAGUE OF WOMEN VOTERS, *supra* note 3, at 26.

the Muskingum, and Lake Erie.⁴⁷ Other basin states are similarly permissive; however, they are moving toward controls.⁴⁸ The delay has been caused by the lack of shore facilities to accept these wastes and perhaps the fear of antagonizing many small boat owners who would have to incur the costs of equipping their boats with approved sanitary facilities.

(4) *Federal Government Installations.* — One remaining pollution source should not be ignored. This is the pollution caused by federal government facilities. On November 17, 1965, President Johnson ordered all federal installations to provide a minimum of secondary waste treatment.⁴⁹ Federal water resource projects and facilities as well as operations supported by federal loans, grants, or contracts are included in the executive order.⁵⁰

Nationally, in 1966, at least 237 federal installations were still improperly discharging wastes into United States waterways.⁵¹ Some of these improper discharges flow into Lake Erie from Selfridge Air Force Base, the Naval Air Station at Gross Ile, and the United States Coast Guard Station at the mouth of the Detroit River.⁵² The National Aeronautical and Space Administration adds to the problems of Rocky River in Cleveland.⁵³ It is difficult to comprehend how the federal government expects to lead the clean up of America's waters when, in 3 years, it has failed to abate pollution from its own facilities.

(5) *Resources Required to Stem the Flow of Infectious Agents.* — Possibly only by reading innumerable public statistics or engineer-

⁴⁷ For a summary of state laws, see WASTES FROM WATERCRAFT, *supra* note 43, at 43.

⁴⁸ Testimony of the Basin States before FWPCA Enforcement Conference on Lake Erie, June 1968, held in Cleveland, Ohio.

⁴⁹ This order entitled Prevention, Control, and Abatement of Water Pollution by Federal Activities, Exec. Order No. 11,258, 30 Fed. Reg. 14483 (1965), was revised by Exec. Order No. 11,288, 31 Fed. Reg. 6857 (1965), which made the Department of the Interior responsible for enforcing the control program.

Under the conclusions and recommendations of the conferees in August 12, 1965, the federal installations were to have been completed and waste treatment facilities operational by August 1966. LAKE ERIE REPORT, *supra* note 5, at 70.

⁵⁰ U.S. DEP'T OF INTERIOR, FWPCA, WATER POLLUTION PROBLEMS OF THE GREAT LAKES AREA 14 (1966).

⁵¹ N.Y. Times, Jan. 3, 1968, at 96.

⁵² MICH. DEP'T OF CONSERVATION, *supra* note 11, at 118.

⁵³ OHIO DEP'T OF HEALTH, *supra* note 11, at 17.

Other federal facilities adding to pollution are the Michigan Army Missile Plant at Warren, Michigan, and the Detroit Arsenal in Warren, Michigan. LAKE ERIE REPORT, *supra* note 5, at 59.

ing reports can one really begin to appreciate the callous disregard for the public well being demonstrated by many communities. It is claimed that nationally 20 percent (over 2000) of the municipalities have no treatment for their wastes before dumping them into the rivers and streams. Another 30 percent give only primary treatment which, although an improvement, is not a very significant one.⁵⁴ As of 1962, ninety communities in Ohio had no municipal waste disposal facilities.⁵⁵ The level of sanitary treatment in 1965, when the FWPCA's work began, was so low that Herculean efforts were necessary to make any progress in reducing the infectious agents entering Lake Erie. Efforts of this magnitude are not being made in all areas and for all types of wastes. Almost nothing is being done about many types of very dangerous wastes, as will be shown later in this article. The City of Cleveland hopes to spend \$100 million in bond proceeds to abate its pollution. This is the kind of money that is involved in serious abatement activity. Otherwise, our picayune expenditures barely keep pace with our increasing urban population.⁵⁶ It is difficult to know what pollution abatement will actually cost but we must condition ourselves to thinking in terms of many billions of dollars. The time has come to start spending the \$26 to \$29 billion the FWPCA thinks is needed to upgrade municipal and industrial waste treatment facilities.⁵⁷ Most

⁵⁴ NATIONAL WILDLIFE FOUNDATION, NEEDED: CLEAN WATER 8 (1966).

⁵⁵ See U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, PUBLIC HEALTH SERVICE, 1962 INVENTORY OF MUNICIPAL WASTE FACILITIES, REGION V, at 115-52 (1963).

⁵⁶ ADVISORY COMMITTEE ON INTERGOVERNMENTAL RELATIONS, INTERGOVERNMENTAL RELATIONS SUBCOMMITTEE OF THE HOUSE COMMITTEE ON GOVERNMENT OPERATIONS, 88TH CONG., 2D SESS. METROPOLITAN AMERICA: CHALLENGE TO FEDERALISM 29 (Comm. Print 1966).

The cost for controlling water pollution is indirectly associated with desired water quality and directly associated with the treatment required to obtain this quality.

In addition to the capital expenditures for present treatment facilities, some \$40 million are spent annually to maintain and operate these sewerage systems. With increase in population and per capita water use and the corresponding increase in nutrient and oxygen-demanding loads, *the present plants, sewers and associated operating costs will soon become grossly inadequate to maintain even the existing water quality.* Without improvements and expansions, Lake Erie would quickly become a virtual cesspool and its tributaries something worse. It should be noted at the start that, due to increasing costs, the longer such construction is delayed the greater the expense will be. LAKE ERIE REPORT, *supra* note 5, at 83 (emphasis in original).

⁵⁷ *Ohio Water Resources*, NEWSLETTER OF THE OHIO WATER COMMISSION, April 1968. However, the cost may run to \$100 billion. See U.S. DEP'T OF INTERIOR, FWPCA, A NEW ERA FOR AMERICA'S WATERS 6 (1967).

"Construction costs for providing adequate secondary treatment and sewers at all municipalities in the Lake Erie basin is \$1 billion. Another \$1.41 billion will be required to expand the facilities in 1990." LAKE ERIE REPORT, *supra* note 5, at 84.

communities need to bring their facilities up to the secondary treatment standards adequate for the population they are serving. All water, including storm drainage, must be treated. For many communities, tertiary treatment will be required,⁵⁸ if their waste discharges are not to adversely affect the receiving stream.⁵⁹

Flow augmentation will be necessary for some tributaries, though such construction should not be a substitute for adequate waste treatment.⁶⁰ At low-flow periods, the Cuyahoga River is used completely by Akron. The only flow below the Lake Rockwell Dam comes from leakages, drainage from small tributaries, and water used for washing the filters of the Akron Water Treatment Plant.⁶¹ Thus, additional flow is necessary even after the best wastewater treatment reasonably attainable under present technology has been provided.

However, even if this Herculean effort is made to reduce the flow of infectious agents, the Lake will not be useful until the other pollutants are controlled and removed.⁶² Phosphates, of prime importance among these other types of pollutants, are considered next.

⁵⁸ See U.S. DEP'T OF INTERIOR, FWPCA, NEW WATER FOR OLD (1966). Mosquito Creek Sewer District, Ohio, has added tertiary treatment. OWPCB, CLEAN WATER FOR OHIO 1 (Spring 1968).

The FWPCA recommends advanced waste treatment at 67 treatment plants. They further recommend that by 1990, in order to meet population growth, all municipalities in the Lake Erie Basin should provide advanced waste treatment. LAKE ERIE REPORT, *supra* note 5, at 84. See also *id.* at 13.

⁵⁹ The impact of the waste water on stream ecology has not been discussed in this paper. For information see U.S. DEP'T OF INTERIOR, FWPCA, BIOLOGICAL FIELD INVESTIGATIVE DATA FOR WATER POLLUTION SURVEYS (1966); U.S. DEP'T OF INTERIOR, FWPCA, WATER POLLUTION CONTROL, WASTE TREATMENT AND WATER TREATMENT, SELECTED BIOLOGICAL REFERENCES ON FRESH AND MARINE WATERS (1966).

⁶⁰ OUTDOOR AMERICA, Feb. 1968. The sum of \$21.3 million is proposed to be spent for diluting the effluents entering the Rappahannock in Virginia. This is the approach favored by the Corps of Engineers and Construction proponents.

Basin water resources are for the most part not managed for flow regulation and flood control. Some reservoirs mainly for water supply storage have been built or are being built on the Maumee, Sandusky, Cuyahoga, Rocky River, Grand River (Ohio), and on Canadaway, Silver, Chataqua, Clear Lake, and Slippery Rock Creeks. Flow regulation for waste assimilation is being considered on the Buffalo, Cuyahoga, Sandusky, Maumee, Huron (Mich.), and Raisin Rivers. LAKE ERIE REPORT, *supra* note 5, at 21.

⁶¹ OHIO DEP'T OF HEALTH, *supra* note 11, at 11.

⁶² For additional references, see Westgarth, *Pollution of Streams by Agriculture*, in WATER AND ENVIRONMENTAL QUALITY, OREGON STATE UNIVERSITY WATER RESOURCES RESEARCH INSTITUTE 107, 114 (Jan. 1968).

B. Chemical Fertilizers

Chemical fertilizers act as plant nutrients. They enter the Lake waters as mineral substances in solution, particularly the nitrates and phosphates (primarily from detergents in municipal wastes). These nutrients cause a vast increase in algae which, following their natural life cycle, die and sink to the Lake bottom. There they combine with oxygen in the water, decompose, and release their nutrients to fertilize more algae.⁶³ Due to a thermal gradient, the Lake water is stratified and circulates little. Thus, the bottom may have no oxygen. Biologically it is dead. When the entire Lake loses its dissolved oxygen it too will be dead.⁶⁴ All lakes go through this process, called eutrophication, in geological time — not “man” time.⁶⁵

Plant nutrients continue to flow into Lake Erie without diminution 3 years after the FWPCA began trying to clean up the Lake.⁶⁶ The two primary nutrients are phosphorus and nitrogen in various forms. As nitrogen is ubiquitous, all attempts at control over nutrients center on eliminating phosphorous.⁶⁷ The phosphorus entering Lake Erie amounted to 137,000 pounds per day in 1965.⁶⁸ By 1967 the discharge of phosphates into Lake Erie increased to 152,000 pounds per day.⁶⁹ Municipal wastes make up

⁶³ U.S. Dep't of Interior, News Release, *Eutrophication Task Force To Develop Algal Growth Potential Procedure* (Dec. 28, 1967). “The annual BOD resulting from the organic remains of the lake's algae causes an oxygen demand estimated at 18 times greater than that from treated sewage.” LAKE ERIE REPORT, *supra* note 5, at 35. See also *id.* at 31.

⁶⁴ Thomas, *The Eutrophication of Lakes and Rivers, Cause and Prevention*, in BIOLOGICAL PROBLEMS IN WATER POLLUTION 299 (U.S. Dep't of Health, Educ. and Welfare 1962).

⁶⁵ See generally Harding, *Lakes*, in HYDROLOGY 220 (Meinzer ed. 1942); Lee & Fruh, *The Aging of Lakes*, in INDUSTRIAL WATER ENGINEERING (1966); Powers & Robertson, *The Aging Great Lakes*, SCIENTIFIC AM., Nov. 1966, at 95.

⁶⁶ U.S. DEP'T OF INTERIOR, FWPCA, LAKE ERIE SURVEILLANCE DATA SUMMARY 1967-1968, at 29-30 (May 1968; G. HARLOW, FWPCA, SURVEILLANCE SUMMARY (June 1968).

At Cleveland the numbers of planktonic algae have increased by 30 times in the past 35 years. Algal blooms in the Western Basin show 10 times the number of cells ever found at Cleveland per unit of volume. LAKE ERIE REPORT, *supra* note 5, at 33.

⁶⁷ G. HARLOW, FWPCA, STATEMENT ON PHOSPHORUS REMOVAL AND PROPOSED RECOMMENDATION FOR LAKE ERIE (June 1968).

⁶⁸ G. HARLOW, *supra* note 66. Of the 13 south shore tributaries sampled, the Maumee River contributes the largest quantities of total solids and total phosphates. U.S. DEP'T OF INTERIOR, FWPCA, LAKE ERIE SOUTH SHORE TRIBUTARY LOADING DATA SUMMARY 1967, 3 (Aug. 1968).

⁶⁹ REPORT OF THE LAKE ERIE ENFORCEMENT CONFERENCE TECHNICAL COMMITTEE 13 (March 1967) (Table 4). [hereinafter cited as LAKE ERIE ENFORCEMENT CONFERENCE REPORT]. However, the *Lake Erie Report*, *supra* note 5, at 2, continues to

72 percent, rural water runoff 17 percent, industrial wastes 4 percent, and urban water runoff 7 percent. In municipal wastes, 66 percent of the phosphorus comes from detergent. Most of the remainder comes from human wastes.⁷⁰ A pound of detergent which contains seven-tenths of a pound of phosphate, will produce 700 pounds of algae, which in turn will die and release the phosphate to grow another crop.⁷¹ The immense encouragement to algae growth given by detergents brings the danger that the Lake will reach a state of eutrophication whereby, in spite of elimination of all waste inputs, the bottom sediments become such that the cycle is indefinitely perpetuated.⁷² The algae blooms and low oxygen levels already found in the Lake lend credence to this fear. In 1964, a 2600 square-mile area in the central basin was found practically devoid of oxygen beneath the thermocline.⁷³

The immediate effects of these algae are the eyesores created at beaches when this material is washed ashore^{73a} and the ecological

list the phosphorus contribution from sources within the Lake Erie Basin at 137,000 pounds per day.

⁷⁰ G. HARLOW, *supra* note 67.

⁷¹ Hill, *The Great and Dirty Lakes*, SATURDAY REV. Oct. 23, 1965, at 32.

Some of the inorganic products of sewage treatment plants, especially phosphorus, do not, as once believed, flow out of the lake. For example, about 100,000 lbs/day of the phosphorus discharged remains in the lake and is reconverted with carbon, nitrogen, etc. into cellular organic matter which in turn contributes to the huge demand for oxygen that has been so disastrous. The potential oxygen demand that would be generated for the entire lake through productivity of organic carbon is about 9.8 billion pounds annually. LAKE ERIE REPORT, *supra* note 5, at 35.

⁷² U.S. DEP'T OF INTERIOR, *supra* note 66, at 33.

Phosphorus and other nutrient and organic matter added to the lake eventually end up on the sediments. Instead of Lake Erie forming a waterway for sending wastes to the sea, it has become a trap that is gradually storing much of the material dumped into it over the years. The nutrients resting in the sediments are relatively innocuous until summer stratification and deoxygenation, when they can come rapidly back into the water to be useful as a plant nutrient again. Therefore it is possible that in a relatively short time the overproductivity of Lake Erie can become self-sustaining because of this ever-increasing reserve. It is also possible that if this alarming process grows, Lake Erie may face a sudden biological cataclysm that will exhaust, for a time, most of the oxygen in the greater part of the lake. Such a catastrophe would make the lake's present difficulties seem mild by comparison. LAKE ERIE REPORT, *supra* note 5, at 35.

⁷³ Address by C. Northington, Director of Lake Erie Field Station, League of Women Voter's Education Fund's Seminar in Cleveland, Mar. 30- Apr. 1, 1965.

Nearly one-fourth of the total lake area now becomes nearly devoid of oxygen in bottom water during summer thermal stratification and this situation is increasing both in extent and duration of occurrence. Oxygen deficiencies also occur intermittently for short periods in the western basin bottom waters. LAKE ERIE REPORT, *supra* note 5, at 33-34.

^{73a} Unfortunately *much of the New York shoreline with its rocky base is ideally suited for the production of continual crops of attached algae which*

change in the Lake that is destroying commercial fishing.⁷⁴ The highest commercial fish yield of record, 1915, was 76 million pounds. This had declined to an average of 52 million pounds in 1960-64,⁷⁵ and in 1967, fish production was down to 49.4 million pounds.⁷⁶

Even more important, the commercial value of the catch has substantially declined as the more desirable species have been replaced by scavenger fish. Carp accounted for nearly half the catch reported in the Michigan waters of Lake Erie in 1966.⁷⁷ Whitefish and pike have virtually disappeared; biological as well as commercial extinction is imminent. Blue pike production in 1956 was nearly seven million pounds, worth \$1,316,000. By 1963, production was down to 200 pounds, worth \$120.⁷⁸ In 1964 it was but 136 pounds.⁷⁹ "The big [Cleveland] port has only one commercial fisherman left, and [he] is leaving too."⁸⁰ To reverse this trend, salmon and trout plantings were made in 1968. The introduction of coho salmon into Lake Erie is a pilot program carried out under the Anadromous Fish Act.⁸¹ Such a program apparently has been successful in Lake Michigan. Time will tell whether these fish take to other Lakes.⁸²

Nutritional over-enrichment of Lake Erie presents the greatest

are caused by phosphorus carried to the New York shoreline by Lake Erie. An aerial observation of the shoreline gives view to endless windrows of decomposing algae which have been washed upon the beaches. To a person wading through these masses toward the cleaner offshore waters, the slime and stench are almost unmanageable. LAKE ERIE REPORT, *supra* note 5, at 52 (emphasis in the original).

⁷⁴ Over enrichment of Lake Erie with nutrients can also leave an undesirable taste and odor in the water supply. LAKE ERIE REPORT, *supra* note 5, at 2. It is disquieting to note that waterblooms of algae can be poisonous under certain circumstances. See Gorham, *Toxic Waterblooms of Blue-Green Algae*, in BIOLOGICAL PROBLEMS IN WATER POLLUTION 36 (U.S. Dep't of Health, Educ. and Welfare 1965).

⁷⁵ U.S. DEP'T OF INTERIOR, FISH AND WILDLIFE SERVICE BUREAU OF COMMERCIAL FISHERIES, REPORT ON COMMERCIAL FISHERIES RESOURCES OF THE LAKE ERIE BASIN 106 (1966).

⁷⁶ 12 GREAT LAKES NEWSLETTER, No. 4 (Mar.- Apr. 1968).

⁷⁷ MICH. DEP'T OF CONSERVATION, *supra* note 11.

⁷⁸ Address by Stewart Udall, Secretary of the Interior, United Action for Clear Water Conference 25, in UAW REPORT OF PAPERS PRESENTED AT CONFERENCE HELD AT COBO HALL (Nov. 6, 1965).

⁷⁹ U.S. DEP'T OF INTERIOR, *supra* note 75, at 46.

Price per pound of fish caught in Lake Erie has been cut in half in the last 10 years as less desirable species such as smelt and yellow perch replace more valuable commercial fish. LAKE ERIE REPORT, *supra* note 5, at 29.

⁸⁰ *Blighted Great Lakes*, LIFE, Aug. 23, 1968, at 36, 38.

⁸¹ 12 GREAT LAKES NEWSLETTER, No. 3 (Jan.-Feb. 1968).

⁸² Kirkpatrick, *The Coming Salmon Boom*, NATIONAL WILDLIFE, Aug.-Sept. 1968, at 4; Wall Street Journal, June 4, 1968, at 1, col. 4.

threat to its future.⁸³ Yet little has been done to stop it. One approach would be to change the composition of detergents so as to end the use of plant nutrients as an ingredient of detergents. Detergents have been changed once under pressure of society. Until late 1964, alkylbenzene sulfonate (ABS) was a major ingredient of detergents. This was not biodegradable (decomposable organically), and the result was detergent foam which appeared in drinking water and complicated all sewage treatment. Between 1961 and 1964, hearings held by federal and state legislative bodies "encouraged" the detergent industry to develop "soft" or biodegradable products. Linear alkylate sulfonate (LAS) was developed. In late 1964, substitution of this raw material in brand-name products began, and by July 1965, all washing and cleaning products manufactured for household and industrial use were biodegradable.⁸⁴

Thus, the soap and detergent industry solved one technical problem, but polyphosphates continue to be used in the manufacture of detergents. The importance of this ingredient lies in the synergistic effects obtained when used with surfactants. Phosphates provide alkalinity, increase dirt and grease removing capacity, reduce redeposition of dirt, soften water, limit scum formation, and prevent fiber staining. The industry claims an acceptable substitute for phosphate is not available.⁸⁵ This may be true, but as is so often the case, the technical knowledge necessary for societal regulation of a social problem is in the hands of those who would be regulated. The problems of having the automobile industry recognize its responsibility for providing safe automobiles that do not pollute the air provide illustrations of the lengths to which industry will go to prevent any improvement in their product. If 50,000 automobile deaths a year do not disturb the automobile industry, the destruction of Lake Erie is not likely to disturb the detergent industry.⁸⁶

"The soap and detergent representatives acknowledged that phosphates affect the nutrient balance of waters, but believe the

⁸³ See U.S. DEP'T OF INTERIOR, FWPCA, BIOLOGICAL ASSOCIATED PROBLEMS IN FRESHWATER ENVIRONMENTS 103 (1967).

⁸⁴ *The Conversion from ABS-to LAS-Based Detergents*, FACTS ABOUT DETERGENTS: (Fact Sheet of the Soap and Detergent Ass'n); *LAS Detergents and Problems of Stream Foam*, 45 CHEMICAL ENGINEERING NEWS, Feb. 27, 1967, at 20; *LAS detergents relieve Stream-foam Problems*, THE AMERICAN CITY, Nov. 1967, at 107.

⁸⁵ LAKE ERIE ENFORCEMENT CONFERENCE REPORT, *supra* note 69, at 11.

⁸⁶ See generally R. NADER, UNSAFE AT ANY SPEED (1967); J. O'CONNELL & A. MYERS, SAFETY LAST (1966).

exact role in algae growth and eutrophication had not been clearly defined."⁸⁷ They pointed out that in 1958, 70 percent of the elemental phosphorous sold went into fertilizers and 13 percent became constituents of detergents.⁸⁸ Apparently the kind of proof the industry seeks is that of tragic hindsight. However, a joint government-industry task to investigate control of eutrophication has been formed. It is to develop a standardized procedure to determine algae growth potential (AGP) of various chemicals and waters.⁸⁹ The problem does need more study, for the scientific relationship between nutrients and algae growth is far from being fully understood.⁹⁰ But, the longer we procrastinate the effectuation of phosphate-removal techniques the greater the chance the eutrophication cycle will be able to continue without additional nutrient inputs.

The detergent industry encourages the consideration of phosphate removal in the sewage treatment plant. This achieves the desired result⁹¹ and shifts the removal cost away from the industry.⁹² Phosphate removal has now progressed so that it is technically

⁸⁷ LAKE ERIE ENFORCEMENT CONFERENCE REPORT, *supra* note 69, at 11.

⁸⁸ *Id.*, which also states that 80% of the direct discharge of phosphorous to Lake Erie is from municipal sewage treatment with detergent comprising the largest phosphorous source. However, in the past two years the amount of fertilizer phosphorus used in the Basin has increased by more than 15 percent. LAKE ERIE REPORT, *supra* note 5, at 28.

If an estimated rate of 250 pounds of total phosphorus per square mile per year is used to calculate the agricultural contribution, almost six million pounds are contributed to Lake Erie per year from this source. The nitrogen input from runoff is at least ten times this amount. *Id.* at 56.

⁸⁹ *Task Force Begins Algal Growth Study*, in WATER IN THE NEWS, Jan. 1968, at 1, col. 1 (compiled by the Soap and Detergent Ass'n).

⁹⁰ For further information, see U.S. DEP'T OF INTERIOR, FWPCA, ALGAE GROWTH FACTORS OTHER THAN NITROGEN AND PHOSPHOROUS (1966); Thomas, *supra* note 64, at 299.

⁹¹ The abatement of pollution can be carried on in many ways, waste treatment is but one method. Other methods that could be used would be: (1) recovery and reuse of both the water and/or the pollutant; (2) product modification; (3) process change to prevent the release of the pollutant; (4) disposing in a different medium (burning instead of placing in a water course); (5) dispersion in a greater receiving volume; (6) dilution by artificially augmenting the volume of the receiving environment; (7) detention by holding the pollutant for release gradually or at a more propitious time; (8) diversion to another location for discharge; (9) environmental treatment to remove existing pollutants; and (10) desensitization (vaccination against disease or landscaping treatment facilities, etc.). WASTE MANAGEMENT, *supra* note 8, at 22.

⁹² This may be a proper technique if the cost to society by not having a product, exceeded the cost of removing it from wastes. It does, however, make the development of a substitute product less likely, for society as a whole is absorbing the costs of removal. For further discussion of this concept, see E. MURPHY, GOVERNING NATURE (1967).

possible to remove the substance.⁹³ A variety of substances can be added in the activated sludge process, though aluminum and calcium or sodium⁹⁴ seem to give the best results.⁹⁵ The use of pulverized coal as a filter and absorbent also offers interesting possibilities since after use it can be burned as fuel, eliminating the usual disposal problem. A pilot plant utilizing this technique is being constructed at the Cleveland Easterly Sewage Plant.⁹⁶ This process, in contrast to conventional bio-oxidation systems, does not produce nitrates⁹⁷ from nitrogen compounds, so the concentration of nitrates in the effluent from this process is very low.⁹⁸ Phosphate removal will prevent the phosphates from passing through the sewage treatment facility and into the lake. But, the process can be expected to double treatment costs.⁹⁹

In 1965, the Federal Conference on Lake Erie concluded that secondary treatment plants were to be designed and operated so as to maximize the removal of phosphates.¹⁰⁰ In the time since that pronouncement virtually nothing has been done to implement this objective. All the Lake Erie states except Michigan have chosen to make phosphorus control an objective instead of a requirement.

⁹³ U.S. DEP'T OF INTERIOR, FWPCA, WATER POLLUTION PROBLEMS OF LAKE MICHIGAN AND TRIBUTARIES 24 (Jan. 1968) [hereinafter cited as WATER POLLUTION PROBLEMS].

⁹⁴ When aluminum sulfate and calcium oxide are added to phosphate-polluted water the phosphorus is precipitated out and the acidity of the water is reduced.

⁹⁵ Barth & Ettinger, *Mineral Controlled Phosphorus Removal in the Activated Sludge Process*, 39 J. WATER POLLUTION CONTROL FEDERATION 1362 (1967).

⁹⁶ Fosdick, *Report on Present Status of a New Simple Low Cost Coal Sewage Treatment*, NAT'L PARKS MAGAZINE, Apr. 1966, at 18.

⁹⁷ Nitrates of course are also nutrients. Most nutrient removal plans ignore this, considering removal to be technically too difficult. *But see Beck, The Biological Removal of Nitrogenous Compounds from Sewage Treatment Plant Effluents*, U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, PUBLIC HEALTH SERVICE 306 (1965).

⁹⁸ Statement of Bertram C. Raynes, Vice President, Rand Development Corporation (1967).

⁹⁹ Statement of Mr. George Eagle, Conference on Pollution of Lake Erie and Its Tributaries (June 4, 1968). Perhaps these additional costs may be subject to considerable reduction. Studies have shown that reduction of more than 70 percent of the total phosphate can readily be achieved with existing treatment facilities equipped with chemical feeding even in the absence of any mixing and flocculation facilities. *See MICHIGAN DEP'T OF PUBLIC HEALTH, WASTEWATER SECTION DIVISION OF ENGINEERING, and DOW CHEMICAL COMPANY, STUDIES ON REMOVAL OF SUSPENDED MATTER AND BIOCHEMICAL OXYGEN DEMAND* (1967).

¹⁰⁰ REVISED CONCLUSIONS AND RECOMMENDATIONS OF THE CONFEREES, CONFERENCE ON POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES 8 (Aug. 12, 1965) (Conclusion No. 2). On October 4, 1968, another Federal/Interstate Lake Erie Enforcement Conference was held in Cleveland. Ohio requested 6 more months to *prepare* for mandatory removal of phosphate. The FWPCA continued to reaffirm the 1971 date as the time limit for putting the phosphate removal program into operation.

Michigan has made it a requirement only in the Detroit area.¹⁰¹ One firm in Michigan reduced its level of phosphorus discharge by 95 percent. The federal government recommends the adoption of requirements calling for a 92 percent reduction of the current input of phosphorus by municipal discharges.¹⁰²

Phosphates continue to flow into the Lake. In 1967, George Eagle, Chief Engineer of the Ohio Department of Health testified:

Studies are being made on maximizing phosphate removals at all the major secondary sewage treatment plants in the Lake Erie Basin. Regular analysis are being made of influent and effluent samples, adjustments are being made to improve removals and in some instances pilot and/or experimental studies are being carried out. At Cleveland Easterly plant a full scale plant study is proposed.¹⁰³

It should be noted, however, that the announcement of this study occurred 2 years after the basin states and the federal government agreed plants should be designed and operated so as to maximize phosphate removal. In 1968 Mr. Eagle said phosphate removal is going to be required. It is not clear to this writer when Mr. Eagle means this will take place.

In the face of this threat, studies are substituted for programs and programs are substituted for the actions that would terminate the constant flow of nutrients into the Lake. As long as sewage treatment continues to be as pollutionally ineffective as it is, the waters of the Great Lakes will continue to deteriorate, because the nutrients do not disappear, but become incorporated into the steadily expanding organisms forming the water nutrient cycle.¹⁰⁴

¹⁰¹ WATER IN THE NEWS, July 1968 (compiled by Soap and Detergent Ass'n).

¹⁰² G. HARLOW, *supra* note 67.

¹⁰³ CONFERENCE PROCEEDINGS, *supra* note 35, at 215.

¹⁰⁴ MICHIGAN NATURAL RESOURCES COUNCIL, THE GREAT LAKES — HOW MANY MASTERS CAN THEY SERVE? 10 (11th Annual Conference 1966).

Reducing the total phosphorus discharge from all in-basin sources to 40,000 lbs/day should control algal growths and arrest the aging process in Lake Erie. In order to accomplish this level of reduction it will be necessary to reduce the discharge of total phosphorus from municipal and industrial wastes to 9,000 lbs/day. LAKE ERIE REPORT, *supra* note 5, at 2. This will require an average reduction in the present rate of input from such sources of about 90 percent. By the year 1990, nearly complete removal of phosphorus from municipal and industrial wastes, together with substantial reduction in the phosphorus contribution from runoff will be required to accommodate projected population increase. *Id.* at 13.

"If the total phosphorus discharges continue unchecked, the phosphorus load is expected to increase to 227,000 lbs/day by 1990." *Id.* at 2.

Present FWPCA recommendations call for effective nutrient removal to be implemented by 1972. *Id.* at 11. However, it is doubtful that this will be accomplished.

The goal is to reduce algal production throughout the western basin of the

C. Industrial Wastes

Because a body of water can meet Ohio's *Industrial Water Supply* criteria with an infinite bacteria count and an oxygen content below that which will support fish life, the Ohio government can report progress while pollution continues. Thus, the state is often advocate and defender of those who ruin our water resources.¹⁰⁵

A great deal of money has been spent in the past 3 years to alleviate the problems caused by the disposal of industrial wastes into Lake Erie and its tributaries. The result of this expenditure is that the water is not as badly polluted as it might have been. However, net improvements, if any, in the quality of these bodies of water are not to be found.¹⁰⁶

Before World War II, municipal sewage exceeded in amount the industrial wastes. After the war, industrial waste was greater than municipal sewage by a ratio of seven to six.¹⁰⁷ Thus, we entered the second half of the 20th century with a source of pollution every bit as great as that from domestic wastes but which was often much more deleterious in its effect on a water ecosystem. For example, 24 ten-thousandths of a gallon of dairy milk waste has a pollutant equivalent to that of a gallon of domestic sewage.¹⁰⁸ The mineral and chemical residuals of modern industry include

lake and along all shores to approximately the productive levels now existing in midlake, central, and eastern basin waters. Thus nuisance growths will be greatly reduced in frequency and extent, and probably within two or three years after inputs are under control. It is quite likely, however, that nuisance algal growths will continue to occur occasionally with blooms of proportions something less than at present for some years to come — perhaps ten or more. Hypolimnetic dissolved oxygen depletion, directly related to algal productivity, will continue for at least the same length of time. This is because of the existing very large nutrient storage in bottom sediments. These nutrients are released under naturally occurring conditions, largely uncontrollable at present. *Id.* at 9.

¹⁰⁵ See, for example, almost any publication of the Ohio Water Pollution Control Board, including *Ohio Shows Major Gains in Anti-Pollution Fight*, CLEAN WATERS FOR OHIO (Spring 1968). This article is typical of their publications, but the scientific reports of the federal government show a continued deterioration of water quality.

¹⁰⁶ The 1963-1965 data can be compared to the 1967 data. In the Western Lake Erie Basin, all chemical constituents increased except chlorides, silica, and chemical oxygen demand. Dissolved solids increased 5 percent. In the Central Basin, all chemical constituents increased except chlorides, silica, and nitrates. Dissolved solids increased 10 percent. In the Eastern Basin, all chemical constituents increased except silica, ammonia, and nitrates. Dissolved solids increased 14 percent. Silica is the only chemical to have decreased in all three basins, an average of 26 percent. This decrease is accompanied by increases in diatom populations (an algae) which utilizes silica. The overall water quality of Lake Erie is worse than in 1963-64. G. HARLOW, *supra* note 66.

¹⁰⁷ E. MURPHY, *supra* note 25, at 89.

¹⁰⁸ *Id.* at 101.

petrochemicals, phenols, salts and acids. Pollution control is complicated by the 400 to 500 new chemical substances created each year.¹⁰⁹ Some of the effects are extremely complex due to their synergistic effects (additive and interrelative) and appreciably influence the ecological balance. To the extent that these pollutants decrease the dissolved oxygen content of the water they also limit the water's ability to assimilate organic pollutants such as municipal sewage wastes. Although, some industrial wastes are very difficult to remove from water and technology has not advanced sufficiently to handle such a problem,¹¹⁰ most industrial wastes are subject to control.¹¹¹ The problem is cost.¹¹² The traditional approach of the business community has been to lower its costs of production by imposing the harmful effects of its waste disposal upon third persons or the community at large. This is clearly a form of violence against others. Unfortunately, it has been a wrong without a remedy.

It should of course be recognized that the costs to society of pollution can vastly exceed the cost of abatement.¹¹³ Thus pollution control may in the long run have a net cost much lower than appears from the present expenditures needed to abate pollution. A businessman resists pollution control because it costs him money.¹¹⁴ He generally cares little for the social costs (negative externalities) of his economic decision. In the extreme case, a businessman faced with removing a building might burn it down rather than remove it piece by piece even though the burning process would destroy a town. This is not very different from what is presently being done to our environment by industrial water pollution. In fairness to industry, it should be recognized that among the costs of abating pollution, capital requirements often are astronomical.

In 1939 the Special Advisory Committee on Water Pollution

¹⁰⁹ NATIONAL ACADEMY OF SCI., NATIONAL RESEARCH COUNCIL, WASTE MANAGEMENT AND CONTROL 12 (Pub. No. 1400, 1966).

¹¹⁰ Soluble salts are nearly impossible to remove.

¹¹¹ E. LOBBEL, INDUSTRIAL WATER RECLAMATION DEVELOPMENTS 7, 12-14 (1967).

¹¹² Rocheleau & Taylor, *An Industry Approach to Pollution Abatement*, 36 J. WATER POLLUTION CONTROL FEDERATION 1185 (Oct. 1964).

¹¹³ Kapp, *Social Costs of Business Enterprise*, in CONTROLLING POLLUTION 82 (M. Goldman ed. 1967).

¹¹⁴ Pasek, *The Needs and Obligations of Industry*, in U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, PUBLIC HEALTH SERVICE, PROCEEDINGS — THE NATIONAL CONFERENCE ON WATER POLLUTION 309 (1961); Smith, *The Industrial Point of View*, in WATER POLLUTION CONTROL AND ABATEMENT 134 (T. Willrich & N. Hines ed. 1965).

of the United States Natural Resources Committee estimated the paper industry would have had to invest a sum equal to 15 percent of its total value and the petroleum industry an amount of up to one-third its capital investment to completely eliminate all of the industry's wastes.¹¹⁵ The elimination of the taste and odor problems stemming from coke plant discharges in one Cleveland plant required the installation of facilities costing more than \$1 million.¹¹⁶ Expenditures by the oil industry alone for air and water pollution controls exceed \$1 billion with an estimated \$382 million to be spent by this industry in 1968.¹¹⁷ Sometimes it is possible to encourage pollution controls when a profitable by-product can be recovered. Unfortunately, pollution abatement usually cannot be made financially attractive. Even if such a recovery can be made profitable, the amount of capital that must be committed to such facilities makes the plan unattractive to companies with surplus capital and precludes it to those companies without access to such capital. These conditions led to the dumping into Wisconsin streams in 1951 of wood fibers weighing 24,216 tons. These fibers on the open market would comprise 538 freight carloads, worth \$3,500,000.¹¹⁸

When the FWPCA began the attempt to clean up Lake Erie in 1965, it was faced with a large number of industrial water polluters who for years had considered themselves perfectly justified in defiling the environment of all in close proximity. The names of these polluters reads as though it were a *Who's Who in American Industry*.^{118a} Any attempt at regulation would likely bring a cry of anguish followed by "scientific" proof that abatement would drive the company out of business and cost many workers their jobs.¹¹⁹

¹¹⁵ E. MURPHY, *supra* note 25, at 10.

¹¹⁶ REPUBLIC STEEL CORP. (CLEVELAND DIST.), WATER QUALITY CONTROL 4 (1966).

¹¹⁷ *Oil Industry Spends \$1 Billion for Clean-up*, WATER IN THE NEWS, Sept. 1968, at 4 (compiled by the Soap and Detergent Ass'n.)

However, the FWPCA estimates that industry must spend \$285 million in the Lake Erie Basin in the next 5 years to meet their requirements. LAKE ERIE REPORT, *supra* note 5, at 9.

¹¹⁸ E. MURPHY, *supra* note 25, at 104.

^{118a} The twenty largest producers of industrial waste in decreasing order (excluding electric generating plants) are Ford, Republic Steel, Bethlehem Steel, Great Lakes Steel, Jones & Laughlin Steel, Wyandotte Chemical, Pennsalt Chemical, Gulf Oil, McLouth Steel, Allied Chemical, Interlake Steel, Scott Paper, Standard Oil, Midland Ross, U.S. Steel, Mobil Oil, Hammermill Paper, Monsanto Chemical, Diamond Shamrock, and Consolidated Paper. LAKE ERIE REPORT, *supra* note 5, at 7-8.

¹¹⁹ See *Clean Rivers Versus Good Jobs*, THE NATIONAL OBSERVER, Feb. 19, 1968, at 1.

As many abatement plans are costly and do take time to implement, the discovery of what is truth in these contested abatement proposals is difficult. Yet often it is not a technological limitation or even a cost problem but rather a management gap that prevents pollution abatement facilities from being utilized.¹²⁰ Some firms, especially small ones, can be driven out of business. This tendency for environmental control to encourage monopoly or at least favor large industries is worthy of separate study. Nevertheless, we do not favor murderers or robbers merely because they are impecunious. To allow the destruction of our environment by those who claim poverty would be absurd.¹²¹

Today, the FWPCA has had three years to force industry to meet basic standards. Many industries have conformed and more eventually will. Some have had problems since technological limitations on abatement techniques are more prevalent in industrial waste disposal than in domestic sewage treatment. Regardless, the number of industries that in the recent past were and today still are dumping wastes into the tributaries is substantial. In June of 1967, 15 corporations were dumping wastes into the Detroit River.¹²² The FWPCA, in its statement May 22, 1968, named many industrial firms polluting Lake Erie's tributaries.¹²³

¹²⁰ Statement of Bertram C. Raynes, *supra* note 98. "Management gap" refers to a strong desire to resist all change and an almost psychopate fear of governmental regulation.

¹²¹ Nevertheless, the OWPCB exempts villages from pollution controls on the grounds of severe financial hardship. See OWPCB, ANNUAL REPORT 4 (1967).

¹²² Among them, Allied Chemical dumped oil; E.I. duPont, acid; Monsanto, phosphates; Wyandotte, chemicals, suspended solids, chlorides, and oil. MICH. DEPT OF CONSERVATION, *supra* note 11, at 112.

¹²³ Lake Erie and its tributaries receive industrial wastes from 360 known sources. . . . Slightly more than 50 percent of the industries are classified as having inadequate treatment facilities." LAKE ERIE REPORT, *supra* note 5, at 55 (emphasis in the original).

The twenty largest industrial water users excluding electrical power producers discharge 86 percent of the total industrial waste water. Forty-four percent of the total industrial discharge is to the Detroit and St. Clair rivers. Ford accounts for 19.7 percent of the total industrial waste discharge; Republic and Bethlehem Steel account for 14.9 percent and 13 percent respectively. *Id.* at 56. See also *id.* at 77. The Chase Bag Company adds substantial wastes to the Chagrin River. Into the Cuyahoga River, Republic Steel. Jones Laughlin and, in part, U.S. Steel discharge solids, iron, oil, sulfates, ammonia, acids, and other deleterious materials. The Harshaw Chemical Company discharges solids, nickel, flourides, and acids. "Goodyear Aerospace effluent contains heavy metals, cyanides, and other toxic materials." "The Diamond Shamrock Company discharges over 3,000 tons of dissolved solids daily to the Grand River which flows into Lake Erie." The Grand River, the FWPCA added, "is one of the most chemically polluted waterways within the Lake Erie watershed." *Hearings on Water Quality Criteria for the Rocky, Cuyahoga, Chagrin, and Grand River Basins and Their Tributaries Before OWPCB* (May 22, 1968) [hereinafter cited as *Hearings*].

In its engineering report, Ohio¹²⁴ cited 55 industries with water pollution control facilities on the Cuyahoga River. Only 18 of this number are considered as not needing improvement, however, this conclusion is made by an arm of government which recommends water goals so low that the lower Cuyahoga River will have water incapable of supporting fish life in 1975 even if all goals are met.¹²⁵

In order to achieve water of improved quality, industrial waste facilities must be required to be designed and operated so as to maximize the reduction of waste. No waste should be discharged that will adversely affect the ecology of the receiving water. Operating procedures should be instituted to reduce the volume of wastes to be treated. Equipment should be provided to prevent accidental spills or bypassing. Where adequate treatment can be provided, industrial wastes should be discharged to municipal sewers. However, no discharge from industry should be sent through a municipal system where the industrial waste is of such nature that municipal treatment facilities are incapable of properly handling such wastes. Pretreatment or controlled discharge of industrial wastes, particularly from the rubber and chemical industries is necessary.¹²⁶

Why, after 3 years of effort to abate this pollution, are a myriad of industrial wastes still being spewed into our waterways? Why is there no indication that there will be change in the foreseeable future? The answer can only be that our political leaders have never had the serious resolve necessary to carry a successful program to fruition. If the government had desired it, Lake Erie pollution from industrial sources could have been reduced far below the present level. Slow, steady progress toward pollution abatement is sought. But in Ohio it is more slow than steady. After 3 years we have had no progress in terms that can be verified

¹²⁴ OHIO DEP'T OF HEALTH, DIVISION OF ENGINEERING, REPORT AND RECOMMENDATIONS ON WATER QUALITY FOR THE ROCKY, CUYAHOGA, CHAGRIN AND GRAND RIVERS AND THEIR TRIBUTARIES 63 (May 1968).

¹²⁵ The Division recommends that the criteria for *Aquatic Life B* be met by 1975, which with a dissolved oxygen minimum of 2 mg/l precludes fish life. *Id.* at 5.

¹²⁶ These conclusions are similar to those of the FWPCA. Statement of G. Harlow, in *Hearings*, *supra* note 123.

A key recommendation of the FWPCA is that effluent objectives in industrial waste control should be explicitly defined for each pollutant and at least equivalent to the reductions achieved for municipal wastes in a secondary treatment plant. Industries should be required to maintain the flow of dissolved solids from their factories at the present level of discharge, or to decrease this discharge if practical. LAKE ERIE REPORT, *supra* note 5, at 72. For details on the pollution abatement requirements needed for specific industries, see *id.* at 14.

by testing the quality of our waters. Only the glowing reports of the Ohio Government can show progress. These sanguine reports seem to be Ohio's chief contribution to pollution abatement.

D. Organic Chemicals — Pesticides, Insecticides, and Herbicides

The United States Department of the Interior reveals that one part of DDT in one billion parts of water will kill Blue Crabs in 8 days. This is the proportional relationship of one ounce of chocolate syrup to 10 million gallons of milk.¹²⁷ More modern pesticides such as endrin are 50 times more toxic than DDT.¹²⁸

A Lake Michigan study has shown that bottom sediments at Green Bay, Wisconsin had a pesticide concentration two-million-times that of the overlaying water which itself was contaminated.¹²⁹ Nearly one billion pounds were used throughout the world in 1965.¹³⁰ Since these poisons are measured in parts per million (ppm), and concentrations of 5 ppm in water of some of the less toxic ones kill fish, one must muse at the sanity of modern man.¹³¹ Not only are the levels of exposure for lethal results from pesticides very low,¹³² but intakes of these poisons are stored in fatty tissue until a lethal dose is reached. One-tenth of 1 ppm in the diet can after this biological magnification reach at least 10 to 15 ppm. The stored concentration is then passed on to the next consumer in the food chain. Thus, the individual who eats a fish absorbs the fish's life-time accumulation.¹³³ Sometimes the poisons can be traced through several steps in a biological chain; for example DDT on alfalfa fed to chickens produced eggs spiked with DDT.¹³⁴ Of these organic chemical pesticides and insecticides, the chlorinated

¹²⁷ R. RIENOW & L. RIENOW, *MOMENT IN THE SUN* 156 (1966).

¹²⁸ Vivier & Hisbet, *Toxicity of Some Herbicides, Insecticides, and Industrial Wastes*, in *BIOLOGICAL PROBLEMS IN WATER POLLUTION* 167 (U.S. Dep't Health, Educ. and Welfare 1962).

¹²⁹ *WATER POLLUTION PROBLEMS*, *supra* note 93, at 44.

¹³⁰ R. RIENOW & L. RIENOW, *supra* note 127, at 153.

¹³¹ The chemical relationship between pesticides and military chemical and biological warfare — C.B.W., for short — is well known and frightening to comprehend. R. CARSON, *SILENT SPRING* 29 (1962). See also Hersh, *Chemical and biological weapons — The Secret Arsenal*, N.Y. Times, Aug. 25, 1968 § 6 (Magazine), at 26; *Too Horrible To Use?*, *NEWSWEEK*, June 3, 1968, at 58.

¹³² For threshold limit values of chlorinated hydrocarbons, see U.S. DEP'T HEALTH, EDUC. AND WELFARE, *OCCUPATIONAL DISEASES* 244-50 (W. Gafafer ed. 1966).

¹³³ R. CARSON, *supra* note 131, at 29. Fish can concentrate a toxic chlorinated hydrocarbon pesticide by a factor of as much as 10,000. Ettinger & Mount, *A Wild Fish Should Be Safe To Eat*, 1 *ENVIRONMENTAL SCI. & TECHNOLOGY* 203 (March 1967).

¹³⁴ R. CARSON, *supra* note 131, at 30.

hydrocarbons and chlorinated phosphate compounds are the most important. Little is known of their long-term effects. Most of what is known should frighten any thinking person. For instance, application of a solution containing 1 part DDT to 50 parts of water to a lake in California to control gnats resulted in virtual annihilation of the western grebe. Examination of the birds showed concentration of DDT of 1600 ppm. No trace of the chemical could be found in the water for it had entered the life fabric of the lake — the plankton — and was threatening all life in the ecosystem.¹³⁵ Another example is the use of DDT to rid a village in Borneo of flies. Lizards who ate the flies accumulated the poison. Cats ate the lizards and died. Soon the rat population started to proliferate and plague threatened survival of the entire region's populace.¹³⁶

The relationship between many of these chemicals and cancer is only beginning to be appreciated.¹³⁷ Yet pesticides, insecticides, and herbicides have become part of the American way of life for they are, with present technology, necessary for our highly productive modern agriculture.¹³⁸ The price we pay for our cheap and abundant food supply is that we assume the risk these chemicals pose to all mankind.¹³⁹ Before World War II, pesticides were made up mainly of inorganic substances such as copper sulfate, arsenate of lead, calcium, arsenate, etc. World War II brought the development of DDT, the first important chlorinated hydrocarbon. This family of insecticides grew to include dieldrin, aldrin, endrin, toxaphene, lindane, and chloradane, as well as the herbicides 2, 4-D, and 2, 4, 5-T. At the same time the less persistent but equally toxic organic phosphorous compounds which include parathion and malathion were brought into existence.¹⁴⁰

After more than 20 years of often indiscriminate use pesticides

¹³⁵ *Id.* at 51.

¹³⁶ NEWSWEEK, July 22, 1968, at 84.

¹³⁷ See generally R. CARSON, *supra* note 131.

¹³⁸ This does not mean that technology cannot prescribe a less dangerous alternative control over insect pests. Biological pesticides could do the job by utilizing nature's own control agents against insects. Unfortunately, little development work has been done in this area. See Lessing, *A Molecular Bomb for the War Against Insects*, FORTUNE, July 1968, at 87; Ulman, *Bug Business Boom: Farmers Use Insects to Kill Harmful Pests*, Wall Street Journal, Sept. 6, 1968, at 1.

¹³⁹ See generally H. STILL, *THE DIRTY ANIMAL* (1967). C. HERDLEY & L. LEWIS, *THE PESTICIDE PROBLEM: AN ECONOMIC APPROACH TO PUBLIC POLICY* (1967).

¹⁴⁰ O. HERFINDAHL & A. KNEESE, *THE QUALITY OF THE ENVIRONMENT* 36 (1965).

have been disseminated throughout the world. They are now found even in the Arctic far from any known application.¹⁴¹ The use of these pesticides continues to grow.

Pesticides are responsible for tens of thousands of known fish deaths in the Mississippi River and in the State of New York as well as for wildlife losses throughout the nation,¹⁴² yet there seems to be little concern regarding this type of pollution in Lake Erie. Thus, a report by the federal government on Lake Erie fisheries never mentions the problem,¹⁴³ nor does the FWPCA's *Lake Erie Environmental Summary*.¹⁴⁴ The 1965 FWPCA *Lake Erie Recommendations* made no mention of this problem.¹⁴⁵ Yet, a study by the Public Health Service concerning chlorinated hydrocarbon pesticides in Major River Basins, 1957-65 found the poison dieldrin in 55 percent of the samples taken in Ohio's portion of Lake Erie. Seven other pesticides tested for were discovered.¹⁴⁶ Despite this, only Michigan seems to have any real interest in this problem. Their studies have shown pesticide concentration in Lake Michi-

¹⁴¹ Staender, *A Summer in Alaska's Wilderness*, SUMMIT MAGAZINE, Oct. 1966, at 16.

¹⁴² See generally R. RIENOW & L. RIENOW, *supra* note 127.

¹⁴³ See generally U.S. DEP'T OF INTERIOR, FISH AND WILDLIFE SERVICE, BUREAU OF COMMERCIAL FISHERIES, REPORT ON COMMERCIAL FISHERIES, RESOURCES OF THE LAKE ERIE BASIN (1966).

¹⁴⁴ U.S. DEP'T OF INTERIOR, FWPCA, LAKE ERIE ENVIRONMENTAL SUMMARY 1963-1964 (May 1968).

¹⁴⁵ RECOMMENDATIONS OF THE CONFEREES, *supra* note 100. The *Lake Erie Report* of 1968 states that:

Toxic metals such as copper, cadmium, chromium, lead, nickel, zinc, and iron are discharged in significant quantities by primary metals and metal-fabricating industries. Areas of concern are near the mouths of the Rouge, Black, Cuyahoga, and Buffalo Rivers.

Some toxic metals, such as copper, may be accumulated and stored by algae and cause difficulties in the life forms which consume these organisms.

Many organic chemicals are toxic, or near toxic, such as the multitude of insecticides, and the organic compounds discharged by the plastics industries. Phenols are waste products of the iron and oil industries. The Detroit-Maumee basin, Lorain, Cleveland-Akron, and Buffalo areas, produce large quantities of organic chemical wastes. LAKE ERIE REPORT, *supra* note 5, at 63.

In spite of this knowledge the FWPCA states that "[m]any substances toxic to aquatic life and even to human life are discharged to the waters of the Lake Erie basin. Fortunately all are either degraded or diluted to acceptable levels quickly upon reaching the lake proper." *Id.* at 63.

At best the federal government seems capable of mild alarm. "Cause for concern exists in regard to the quantity of pesticides (originating mainly in agricultural areas) and other complex organic chemicals being discharged to the lake. These can be toxic to fish and potentially toxic to man." *Id.* at 35 (emphasis in original).

¹⁴⁶ A. BRIEDENBACH, E. GUNNERSON, F. KAWAHARA, J. LICHTENBERG & K. GREEN, 82 PUBLIC HEALTH REPORTS 143 (1967) (Table 2) [hereinafter cited as BREIDENBACH].

gan that should concern everyone. Michigan is trying to create a special committee to evaluate, monitor, and control pesticides.¹⁴⁷ They are at least aware of the problem. Indeed, the director of Michigan's Department of Conservation believes the further use of these chemicals should be prohibited. One way would be to pass a state law preventing the sale or use of specific highly toxic pesticides, but this would place Michigan farmers at a competitive disadvantage.¹⁴⁸

Pesticides are considered sufficiently dangerous so that they must be registered with the United States Department of Agriculture, which controls their use.¹⁴⁹ If any residue remains on a food crop, then a residual tolerance limit must be established and enforced by the Food and Drug Administration. However, while the government attempts to control the pesticide on food, there is no requirement limiting the amount present in drinking water; the water supply can be poisoned with impunity.¹⁵⁰

A substantial body of literature is developing concerning the known adverse effects of pesticides on wildlife.¹⁵¹ As yet, the information of the effects on man is minimal. While the governmental response to serious societal problems is to ignore them, they do not then disappear.¹⁵²

¹⁴⁷ See 12 GREAT LAKES NEWSLETTER, *supra* note 76, at 6.

¹⁴⁸ McMullan, *The Case Against Hard Pesticides*, MICHIGAN CONSERVATION, Jan.-Feb. 1968. On July 31, 1968, conservation and resource officials of Illinois, Indiana, Michigan, and Wisconsin signed an agreement directed toward protecting the Lake Michigan Basin from further pesticide pollution. Under the agreement, the states will join forces to inventory, monitor, and tighten enforcement over all possible sources of pesticide contamination. This contamination in the Lake was brought into sharp focus by recent findings that DDT was the most probable cause of the death of some 700,000 coho salmon which hatched from eggs which were taken from Lake Michigan brood stock. 12 GREAT LAKES NEWSLETTER, NO. 6, at 1 (July-Aug. 1968).

¹⁴⁹ 7 U.S.C. § 135 (1947).

¹⁵⁰ O. HERFINDAHL & A. KNEESE, *supra* note 140, at 41.

¹⁵¹ See, e.g., U.S. DEP'T OF INTERIOR, FISH, WILDLIFE AND . . . PESTICIDES (1967).

¹⁵² There are some hopeful signs of government action. The United States Department of Agriculture has reduced its own spraying with persistent pesticides by a factor of 50-1 over the past ten years. WATER IN THE NEWS, March 1968, (compiled by the Soap and Detergent Ass'n). See also U.S. DEP'T OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, NEED TO IMPROVE REGULATORY ENFORCEMENT PROCEDURES INVOLVING PESTICIDES (Pub. No. B-133192, 1968). "The 90th Congress already has enacted several major conservation bills. . . , among them H.R. 15779, extending for three years the authority for comprehensive studies on the effects of pesticides on wildlife." CONSERVATION AND CONGRESS, Aug. 15, 1968, at 13 (National Wildlife Federation).

Determination of the role of pesticides in Lake Erie pollution is considered a pollution control need requiring additional research by the FWPCA. LAKE ERIE REPORT, *supra* note 5, at 16.

E. *Silt from Erosion*

Sediments from land erosion are carried as suspended solids and sink to fill tributaries and lake harbors. Removal, while indispensable for maintaining navigability, is costly.¹⁵³ If, as is usually the case, the silt contains other pollutants, there is a further disposal problem.¹⁵⁴ Silt pollution changes the ecology of a lake and tributaries by blanketing fish nests and changing the composition of the lake bottom. Silt as a suspended solid reduces the light which reaches plant life, which in turn slows photosynthesis and thus reduces the oxygen being passed into the water from plant life. The suspended solids reduce the efficiency of water purification treatment and increase the cost.¹⁵⁵ Finally, the silt causes excess wear on hydro-power turbines and pump impellers. In the Lake Erie Basin the sources of these pollutants are highways,¹⁵⁶ and subdivision construction, runoff from agricultural

¹⁵³ General operation and maintenance alone for the Army Corps of Engineers would cost an estimated \$194,300,000. BUDGET OF THE UNITED STATES 283 (Fiscal 1967).

Some 6 million cubic yards of silt is dredged annually in the Erie Basin. Cleveland harbor requires more dredging than any other harbor on the Great Lakes, and it contains some of the most noxious materials. LAKE ERIE REPORT, *supra* note 5, at 57.

¹⁵⁴ Statement of George Harlow, in *Hearings*, *supra* note 123.

Damage to Lake Erie from suspended matter is dependent on the nature of the material. Suspended matter from municipal discharges is primarily organic and oxygen-consuming, and its deposition results in enriched bottom muds or sludge banks. Effects of these wastes are largely local and can be corrected by proper treatment. Suspended matter from certain industries and the material from land erosion are largely inorganic and serve to fill harbors, embayments, ship channels, and the lake. Over 24 million tons of sediment washes into Lake Erie annually; two-thirds of this comes from shore erosion. Another 9 million tons annually is carried to the lake in dredging operations.

Principal sources of suspended solids discharged to Lake Erie are the Detroit, Maumee, Cuyahoga, and Grand Rivers which represent more than 40 million pounds per day. About 1.5 million pounds per day of suspended solids of the Detroit River are from industrial and municipal sources. The Maumee discharges . . . are released during period of heavy rain and high runoff; therefore, control must be instituted through improvements of land use practices in the watershed. The Cuyahoga and Grand Rivers' (Ohio) discharges are believed to be largely from land runoff and from industrial and municipal wastes. The load in the Cleveland harbor results in severe discoloration and the need for frequent dredging. LAKE ERIE REPORT, *supra* note 5, at 60.

¹⁵⁵ Lunin, *The Constant Fight Against Pollution*, in OUTDOORS U.S.A. 149 (J. Hayes ed. 1967). The cost to the people of the United States is estimated at \$500 million annually. TUESDAY LETTER, July 16, 1968. (Nat'l Ass'n of Soil & Water Conservation Districts).

¹⁵⁶ Pollution from construction sites is mainly silt and is similar to agricultural runoff, but the rate per unit area is much higher. The problem is becoming increasingly serious because of the recent intensification of highway and hous-

land,¹⁵⁷ and shore erosion. As with most forms of pollution, this too can be prevented or controlled by proper practices. Costs can be minimized if control is sought at the time of construction or other disturbance of the soil,¹⁵⁸ but this form of pollution continues and, according to Secretary of Agriculture Freeman, costs the American people \$500 million a year.¹⁵⁹

Each year many million tons of silt are deposited in Lake Erie.¹⁶⁰ This in turn is subject to being dredged by the Army Corps of Engineers as part of their harbor maintenance authority.¹⁶¹ Generally, this dredged material is disposed of by dumping it in deep-water areas of the Lake.¹⁶² This dredged material comes from the mouth of the tributaries which is the most polluted portion of the Lake. For example, 1,205,000 cubic yards of muck are taken from the Cuyahoga River and outer harbor at Cleveland each year.¹⁶³

Pollution from this source was specifically dealt with as part of the conclusions of the 1965 conference of what is now the FWPCA:

ing programs in the Erie basin covering large areas of land. There apparently has been no adequate program of reseeding, catch-basins, etc. during construction; and the land is left barren for long periods, especially over winter.

LAKE ERIE REPORT, *supra* note 5, at 58.

For a criticism of the Bureau of Public Roads on the effect of road building on water courses, see W. DOUGLAS, A WILDERNESS BILL OF RIGHTS 147 (1965).

¹⁵⁷ Dunford & Weitzman, *Managing Forests to Control Soil Erosion*, in WATER 235 (1955).

The erosion of the Lake shore contributes an estimated 16 million tons of silt to Lake Erie each year. Shore erosion is responsible for most of the near shore turbidity during storms. LAKE ERIE REPORT, *supra* note 5, at 57.

¹⁵⁸ One study showed a cost of \$165 per acre for immediately applied controls compared to \$838 per acre for control of badly eroded land. The Rockside Story, Three River Watershed District, Ohio.

¹⁵⁹ CONSERVATION NEWS, Aug. 1, 1968, at 5 (National Wildlife Federation).

¹⁶⁰ The State of Ohio's brochure, *Northwest Ohio Needs A Master Plan*, claims more than 2 million tons of silt each year comes from the Maumee River Basin. The *Lake Erie Report*, *supra* note 5, at 56, states that: "At least eight million tons of silt are discharged to Lake Erie from agricultural runoff each year. Nearly half of this is discharged to the western basin." See also note 157 *supra*.

About 33 million tons of sediment reach the Lake each year, almost half of this coming from lakeshore erosion. LAKE ERIE REPORT, *supra* note 5, at 3.

¹⁶¹ 16 U.S.C. § 419 (1964). *Fifteen harbors are dredged* periodically along the United States shore of the Lake Erie basin by the U.S. Army, Corps of Engineers" LAKE ERIE REPORT, *supra* note 5, at 3 (emphasis in the original).

¹⁶² Lake Erie averages 100 feet in depth reaching a maximum of 216 feet. It stores but two percent of the total volume of the Great Lakes. 6 ENCYCLOPEDIA INTERNATIONAL 510 (1966).

¹⁶³ Statement by Colonel Wright, District Engineer, Buffalo District, Corps of Engineers before the FWPCA Enforcement Conference on Lake Erie, June 4, 1968, held in Cleveland, Ohio.

Representatives of the U.S. Army Corps of Engineers are to meet with the Conferees, develop and put into action a program for disposal of dredged material in Lake Erie and its tributaries which will satisfactorily protect water quality. Such a program is to be developed within six months after the issuance of this Summary and effectuated as soon as possible thereafter.¹⁶⁴

Three years later almost nothing has been accomplished. The Corps of Engineers continues to dump highly polluted wastes into areas of Lake Erie still relatively undefiled. They defend this action, with some justification, on the ground that alternative dumping sites are not readily available at a comparable cost. If dumping is to end, the Army contends, then local interests will have to provide and pay for suitable disposal sites.¹⁶⁵ While the Corps may be correct in this respect, it has taken no lead in trying to end this kind of pollution. Instead, it applies a different test to its activities than is applied to other pollutant sources. While the FWPCA believes that polluted material in general entering a lake is harmful and causes a deterioration of lake water quality, the Corps of Engineers demands that others prove the harmfulness of the particular load of pollutants they are dumping into the lake. This approach, if applied to industry, would require no one to end pollution for specific cause and effect can almost never be shown. The Corps says in essence that if the method, the money, and congressional direction are provided, it will stop its polluting activities. Unfortunately, that is probably the only way to stop such actions by this organization. The FWPCA has no control over the Corps, for it is a sister agency that has legal equality. An executive order says that the Secretary of the Army should cooperate in the abatement of pollution,¹⁶⁶ but there is little the Department of the Interior can do to force compliance.¹⁶⁷ If neither the President

¹⁶⁴ RECOMMENDATIONS OF THE CONFEREES, *supra* note 100.

¹⁶⁵ Statement of Colonel Wright, *supra* note 163.

¹⁶⁶ Exec. Order No. 11,288, 31 Fed. Reg. 9261 (1967).

¹⁶⁷ Thus, the FWPCA is limited to joint efforts as a vehicle for determining ways and means to curb this pollution. "A cooperative study between FWPCA and the Corps of Engineers is in progress to find and develop suitable alternate means of disposal other than open dumping in Lake Erie." LAKE ERIE REPORT, *supra* note 5, at 3. One suggestion the FWPCA makes is the possibility of huge lake front developments. *Id.* at 81. FWPCA also states that:

Dredging Lake Erie. A possible step to the immediate improvement of Lake Erie, in addition to the previous recommendations, is the dredging of the lake bottom. This would be the ultimate in refinement of water quality in the lake.

The cost to dredge the top three feet of sediments would be many billions of dollars and would take many decades to accomplish. Because of the complete absence of knowledge about actual benefits of such an undertak-

nor the Department of Defense can control the Corps, then the FWPCA has little hope for achieving such control.¹⁶⁸

Siltation is an expensive form of pollution,¹⁶⁹ though it is not as important a pollutant as those already discussed. Control over the Army Corps of Engineers' dumping will be difficult. The cost, combined with the intransigent attitude of the Corps and the lack of any truly effective political control over this body precludes optimism. The most satisfactory approach would be to stop the entry of pollutants into the Lake's tributaries. If only natural, uncontaminated soil was moved by the Corps, they would be causing little damage.

The control of erosion is technically simple.¹⁷⁰ The continuation of this form of pollution is a classic example of economic negative externalities. It costs a road builder or subdivision builder money to prevent erosion so the costs of continued erosion are passed on to a different, usually larger and more diffuse group. The fact that this pollution is often related to activities of government agencies, such as the road building authorities and highway departments, which are only interested peripherally, if at all, in water pollution abatement, further complicates control. About the only present program for seeking to eliminate this form of pollution is through the operations of the Watershed Protection and

ing and the great expense, this is considered impractical. The FWPCA does not believe that it will be necessary to remove bottom sediments in order to restore Lake Erie water quality. Even if such a project were undertaken, the disposition of the dredged material would be a major problem. *Id.* at 82 (emphasis in the original).

For an executive agency criticism of the Corps, see COMPTROLLER GENERAL OF THE UNITED STATES, NEED FOR IMPROVING PROCEDURES TO ENSURE COMPLIANCE WITH LAW REGARDING DEPOSITION OF INDUSTRIAL WASTE SOLIDS INTO NAVIGABLE WATERS — CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY (Dec. 1966).

¹⁶⁸ The Army Corps of Engineers gets its independence from its close working relationship with the Public Works Committee of the House of Representatives. It carries out feasibility studies and is very influential in determining which congressional districts get pork from the government barrel. For an example of how these projects permeate the nation, see U.S. ARMY CORPS OF ENGINEERS, WATER RESOURCES DEVELOPMENT IN OHIO (1967); U.S. ARMY CORPS OF ENGINEERS, CIVIL WORKS PROJECTS, RECREATION (1967). For a criticism of the Corps of Engineers, planning, see Brooks, *The Plot to Drown Alaska*, ATLANTIC, May 1965, at 53. See generally F. MOSS, THE WATER CRISIS (1967). For a criticism of the Corps' use of cost-benefit studies, see 113 Cong. Rec. 115 (1967); Krutilla, *Is Public Intervention in Water Resources Development Conducive to Economic Efficiency?*, 6 NATIONAL RESOURCES J. 60, 65 (1966).

¹⁶⁹ During the fiscal years 1964 and 1965, the Corps expended approximately \$62.9 million and \$73.1 million, respectively on dredging. See also note 144 *supra*.

¹⁷⁰ INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN, URBAN SEDIMENT CAN BE CONTROLLED (1966).

Flood Protection Act¹⁷¹ administered by the Soil Conservation Service of the United States Department of Agriculture.¹⁷² This program uses federal money and guidance to work through grass root level soil conservation districts. Silt problems are controlled through good soil conservation practices. Proper plowing and plant cover together with water control from small dams minimize erosion and keep silt from entering the larger water courses.¹⁷³ These projects will play a particularly important role in the development and management of the Maumee River Basin.¹⁷⁴

F. *Thermal Pollution*

An atomic-powered generating plant planned to be constructed for the New York State Electric & Gas Corporation on the east shore of Cayuga Lake is to use one half million gallons of water per minute — 720 million gallons a day¹⁷⁵ — for cooling. The hot water returned to the Lake is bound to affect all plant and animal life. A closed-circuit radiator system would cost \$16 to \$20 million and be noisy as well as costly to operate. Cooling towers would cost \$10 million but would lose lake water, ice roads, and cause fogging under certain weather conditions.¹⁷⁶

The problem is not limited to future nuclear generation needs.

¹⁷¹ 16 U.S.C. §§ 1001-09 (1964).

¹⁷² The United States Department of Agriculture has proposed legislation to combat roadside, streamside, and surface mine sediment pollution, but this legislation has not been successful due to the federal economy drive. See TUESDAY LETTER, Aug. 20, 1968, at 1 (Nat'l Ass'n of Soil & Water Conservation Districts).

¹⁷³ U.S. DEP'T OF AGRICULTURE, OHIO MOVES AHEAD IN WATERSHED DEVELOPMENT (1965), See also D. COYLE, CONSERVATION 118 (1957). These programs have resulted in a stabilization of the rate of silt input from rural runoff, though nutrient runoff increases due to increased usage of fertilizer. LAKE ERIE REPORT, *supra* note 5, at 56.

¹⁷⁴ Harvey, *Massive Maumee River Basin Cleanup Planned*, The Toledo Blade, Sept. 17, 1967.

For the purpose of this act [P.L. 566] the Maumee basin has been divided into 27 small watersheds, each with needs for controlling soil runoff. To date only one of the drainage areas, the Little Auglaize River basin, has been project-funded by Congress. There is an urgent need to accelerate the funding of these projects to minimize silt pollution from the Maumee and to extend these projects to other areas of need. The cost of the 27 small watershed protection projects in the Maumee basin is estimated at \$180 million. These projects would reduce the silt load by 80 percent. Similarly all agencies — Federal, State, and local — involved in construction should invoke measures to prevent erosion at construction projects. This problem has recently been recognized by the Bureau of Public Roads in connection with highway construction in the Cleveland metropolitan area. LAKE ERIE REPORT, *supra* note 5, at 81.

¹⁷⁵ CONSERVATION NEWS, June 1, 1968, at 14.

¹⁷⁶ *Id.*

Today, large quantities of water are used as coolants by industry and for conventionally fueled electric power generators. The rejected hot water is harmful to the life in any water course it enters. The most immediate effect is that it kills fish. But it is also harmful in other ways.

Thermal discharges can devastate the biota, as a 3 or 4 degree change in temperature will upset delicate ecological balances. Heat also increases both the toxic effects of chemical pollutants and the sensitivity of aquatic life to these pollutants. Oxygen consumption by aquatic vertebrates doubles for every 22-degree-Fahrenheit rise in stream temperature, yet, as temperatures increase, the water can hold less oxygen in solution. As this dissolved oxygen dwindles because of temperature increases, the thermally polluted waters are less capable of assimilating organic wastes.¹⁷⁷ If nutrients are present, which is Lake Erie's most serious problem, the heat will promote algae growth.¹⁷⁸ The Mahoning River in Ohio has registered temperatures in the summer as high as 120 degrees.¹⁷⁹ Ohio's *Industrial Water Supply* criteria calls for a water temperature not to exceed 95 degrees Fahrenheit. Even this temperature limitation was opposed as too low by industrial representatives concerned with the lower Cuyahoga River.¹⁸⁰

Nationally, about 70 percent of this hot water pollution is caused by the fossil-fueled electric power industry with almost all of the remainder caused by the petroleum, chemical, steel, and pulp and paper industries.¹⁸¹ The demands for water for cooling and condensing purposes seem insatiable. By 1980, the power industry will use one-fifth of the total fresh water runoff of the United States for cooling purposes. It is estimated that the amount of heat to be thus added to water courses will increase six-fold by

¹⁷⁷ DiLuzio, *Water Use and Thermal Pollution*, POWER ENGINEERING, June 1968, at 45.

¹⁷⁸ For further discussion and bibliography of 269 articles on thermal pollution, see Trembly, *Effects of Cooling Water From Steam — Electric Power Plants on Stream Biota*, in BIOLOGICAL PROBLEMS IN WATER POLLUTION 334 (U.S. Dep't of Health, Educ. and Welfare 1962).

¹⁷⁹ Schorr, *Generating Plants Pose a Thermal Pollution Threat To Rivers, Lakes*, Wall Street Journal, Dec. 1, 1967, at 1, col. 1.

Thermal pollution is more serious in tributaries than in the Lake with its vastly greater volume of water. Water used in electric power production may increase in temperature 20-degrees-Fahrenheit or more with one pass through a power plant thus affecting the ecology of smaller bodies of waters. LAKE ERIE REPORT, *supra* note 5, at 64-5.

¹⁸⁰ *Hearings*, *supra* note 123. See, for example, the statement of the Cuyahoga River Basin Water Quality Committee in *id.*

¹⁸¹ DiLuzio, *supra* note 177, at 44.

the end of the century. Part of this increase will be due to the replacement of fossil fuel with atomic fuel by the nation's electric generating industry.¹⁸² Nuclear plants are less heat efficient (largely due to operation at lower steam pressure for safety reasons), and thus produce about 40 percent more heat than an equivalent coal-fired plant. Nuclear plants also are larger than the average fossil fuel plant, for economic considerations require that nuclear plants be capable of generating one million kilowatts.¹⁸³ Even larger regional plants will be developed in the near future to take advantage of the potential economies of large size.¹⁸⁴

Technological solutions to thermal pollution problems have not kept pace with the increased generation of power and its concurrent waste heat problem. However, technological limitations are primarily economic — the cheap dissipation of unwanted heat is difficult to obtain.

One method of partial control is to minimize the longevity of the heat on the aquatic environment. This may be achieved through increasing the turbulence of the receiving stream, preventing water stratification, or diluting the heated effluent through flow augmentation. But even today, and more so in the future, stream management alone is not sufficient; the heat output itself must be controlled. The ability to do this with present technology is limited. Heat not transformed into power possibly could be used beneficially as controlled energy.¹⁸⁵ Desalinization and heating buildings are two possible applications.¹⁸⁶ Much more research is urgently needed. With present technology air dissipation generally must be used to eliminate most thermal water pollution. This, in turn, causes thermal air pollution.¹⁸⁷ These air cooling methods are evaporative cooling towers, non-evaporative cooling tower systems, air cooling, cooling ponds, and spray ponds. Evaporative cooling, the most common, produces considerable fog. Cool-

¹⁸² *Id.*

¹⁸³ Tippy, *Nuclear Heat By-Product Is Threat To Aquatic Balances*, *OUTDOOR AM.*, May 1968.

¹⁸⁴ TVA and General Electric made a contract valued at \$250 million for the biggest nuclear power plant ever designed even though the TVA site lies close to extensive low-cost coal deposits. The plant will have a 2,196,000 kilowatt capacity equal to the combined capacity of all nuclear power plants operating at the time the contract was made. O'Hanlon, *An Atomic Bomb in the Land of Coal*, *FORTUNE*, Sept. 1966, at 132.

¹⁸⁵ DiLuzio, *supra* note 177, at 46.

¹⁸⁶ See *A Utility's Warm Water May Yield Increased Oyster Yield*, *Wall Street Journal*, Dec. 1, 1967, at 1, col. 6.

¹⁸⁷ Yet, reduced air pollution from nuclear power generation encourages such change illustrating the complex multi-dimensional character of the problem.

ing towers are expensive to build and operate. For electric generating plants an evaporative cooling tower system increases construction costs an estimated \$5 per kilowatt of capacity. Capacity reductions and increased fuel costs due to lower efficiency might increase the cost further.¹⁸⁸

Research continues, but really significant breakthroughs in the immediate future seem unlikely. Meanwhile, delay in abating this form of water pollution can mean the serious impairment of our aquatic life.¹⁸⁹ Planned nuclear power plants threaten our environment. In the United States reactors have been ordered for more than 32 million kilowatts of generation.¹⁹⁰ Facilities for almost 15 million kilowatts of generation are being built. Plants having a generating capacity of 2,810,100 kilowatts are now operable. One such plant is planned for Lake Erie near Toledo, and 10 may be on the shores of Lake Michigan by the mid-1970's.¹⁹¹ The West Coast is in danger of losing a \$300 million investment in fisheries because utilities like Portland General Electric are reluctant to commit the \$5 to \$7 million necessary to construct cooling towers.¹⁹² No European country except France allows atomic plants on salmon rivers — France has substantially lost its anadromous fisheries. In Britain the placement of atomic plants is carefully planned with the cooperation of all concerned.¹⁹³

For new power projects subjected to the licensing powers of the Federal Power Commission (FPC) there is some hope. The United States Supreme Court remanded a power company case saying that the FPC must consider the recreational purposes served by the river. Further, the Anadromous Fish Act relating to conservation of fish resources is in *pari materia* with the Federal Power Act.¹⁹⁴ In another case, the Court of Appeals for the Second Circuit held that the FPC has an affirmative duty to consider all relevant facts in considering application for licenses for electric facilities. This includes consideration of alternative sites and the impact on fish life.¹⁹⁵ This case when remanded resulted in what

¹⁸⁸ DiLuzio, *supra* note 177, at 46.

¹⁸⁹ *Id.* at 85.

¹⁹⁰ Tippy, *supra* note 183.

¹⁹¹ 12 GREAT LAKES NEWSLETTER, No. 3 (Jan.-Feb. 1968).

¹⁹² See Netboy, *Fish Versus Nuclear Power*, OUTDOOR AM., June 1968, at 4.

¹⁹³ *Id.*

¹⁹⁴ Udall v. FPC, 387 U.S. 428, 450 (1967).

¹⁹⁵ Scenic Hudson Preservation Conference v. FPC, 354 F.2d 608, 620, 624 (1965), *cert. denied*, 384 U.S. 941 (1966).

is probably the broadest and deepest consideration of the nature and place of natural beauty in any legal proceeding to date.¹⁹⁶

In the case of nuclear power construction, the Atomic Energy Commission (AEC) takes the position that its responsibility extends only to public health and safety considerations in the use of radioactive material. The states, the AEC claims, have authority to deny the right to construct atomic power plants on other grounds.¹⁹⁷ Thus, existing industry and future atomic power plants are subject for all practical purposes only to state control. Since there has been almost no attempt to abate thermal pollution from this source, there is no reason to expect this will change in the foreseeable future. In the Cuyahoga basin the steel industry and Ohio Edison, particularly, should be required to abate this form of pollution. Yet thermal discharge controls are not even listed on the FWPCA list of control measures needed.¹⁹⁸ Avoiding pollution of rivers and streams costs money in the short run where it is a question of fish or men. But in the long run, it is a question of man's survival. He must either control all aspects of nature completely so as to develop a new, artificial ecological equilibrium or else live as a primitive with his environment in control of his existence. At present he is doing neither.¹⁹⁹

G. Petroleum Pollution

The *Torrey Canyon* wreck in March 1967 focused world attention on the problems caused by petroleum pollution. When 80,000 tons of crude oil coated the English beaches, contaminated oyster beds and fisheries, and caused extensive damage to wildlife, the problem became apparent.²⁰⁰ Less spectacular oil pollution is a regular occurrence. Since the English debacle, the relatively tiny tanker, the *Ocean Eagle*, blackened eleven miles of Puerto Rican beach with only a small fraction of its already diminutive 7540

¹⁹⁶ Sive, *Natural Beauty And The Law*, SIERRA CLUB BULL., May 1968, at 18. See also Carver, *Pollution Control and The Federal Power Commission*, 1 NATURAL RESOURCES LAW 32 (1968).

¹⁹⁷ 12 GREAT LAKES NEWSLETTER, *supra* note 191.

¹⁹⁸ Statement of George Harlow, *Hearings*, *supra* note 123, at Table 2. Yet, the average Lake Erie temperature climbed 2 degrees Fahrenheit in 30 years. *Lake Erie Dying but not Dead*, *supra* note 1, at 216.

¹⁹⁹ Living in harmony with nature, however, need not require a primitive standard of living. For a more detailed discussion of man's relationship to his environment, see E. MURPHY, *GOVERNING NATURE* (1967).

²⁰⁰ Nanda, *The "Torrey Canyon" Disaster: Some Legal Aspects*, 44 DENVER L.J. 400 (1967). See also NEWSWEEK, April 10, 1967, at 110.

ton cargo. A few days later Eleuthera Island in the Bahamas was fouled by a small Greek tanker.²⁰¹ This type of pollution is caused not only by contemporary tankers, but also by the 103 tankers rusting on the ocean bottom. Most of these were sunk close to the shores of many countries by German submarines during World War II.²⁰² Petroleum pollution of Lake Erie is a continuing threat that could wreak havoc throughout the basin. A major release of this substance could leave a substantial portion of this Lake in serious straits. The destruction of the Lake as a water supply by oil pollution is not an unfounded fear. Ontario has allowed oil drilling in Lake Erie for many years. Recently Pennsylvania agreed to allow drilling. Essentially this is a gamble of the public's well-being against the opportunity for profit by oil companies. Needless to say, there is no problem finding corporations willing to accept the challenge. If they succeed without polluting the Lake they make money. If they pollute the Lake they still make money. The Lake Erie Basin citizens are the losers.

Oil pollution from ships that use Lake Erie for commercial purposes has increased greatly in recent years.²⁰³ Great Lakes vessels are increasingly oil-fueled as are nearly all ocean-going vessels. Ballast and bilge water often is contaminated. Sometimes sludge in the tanks of ships is cleaned out and pumped into the water.²⁰⁴ Facilities for the disposal of navigational wastes are generally provided in harbors, but the practice of discharging wastes in the open

²⁰¹ The Cleveland Press, April 10, 1968, at 13, col. 1.

²⁰² Fales, *Sunken Time Bombs Full of Oil*, POPULAR MECHANICS, Nov. 1967, at 97; *Are American Beaches in Danger, Too?*, U.S. NEWS & WORLD REP., Apr. 17, 1967, at 46.

²⁰³ MICH. DEP'T OF CONSERVATION, *supra* note 11, at 118. "Most harbors and some other areas of tributaries are subjected to occasional spilling or dumping of oil, either from vessels or shore installations." LAKE ERIE REPORT, *supra* note 5, at 58.

Large quantities are discharged continuously by the steel and oil industries in Detroit, Toledo, Cleveland, and Buffalo. Oil is also contained in municipal wastes in significant quantities.

Oil, as a heavy floating scum, is continuously present in many harbor areas, particularly in the Rouge at Detroit, the Cuyahoga at Cleveland, and in the Buffalo River. *Id.* at 64.

An oil film and rust-red discoloration of two square miles out into Lake Erie is created by Bethlehem Steel as a result of its discharge to Blasdell and Smoke Creeks. A continuous oil discharge of over 30,000 pounds per day is held immediately against the shore by ice during the winter. During spring thaws the entrapped oil is liberated and joins the oils released simultaneously from the Buffalo River and other sources to cause the major oil slicks which occur on the Niagara River. *Id.* at 52.

²⁰⁴ Woodward, *Danger! Oil Polluted Seas*, 53 SCI. DIGEST 63 (Jan. 1963).

lake is reportedly quite common.²⁰⁵ This problem of oil pollution from ships has been of national and international concern for some time.²⁰⁶ The grossly negligent requirement of the 1966 Ocean Waters Restoration Act²⁰⁷ is difficult to prove. The problems of legally proving a case in court combined with the physical difficulties in proving that a specific ship did release oil into the waters severely limit enforcement activities.²⁰⁸

Once oil enters the water, there is little that can be done.²⁰⁹ In an ocean, an oil spill can be tragic; in a shallow lake, it could be a disaster. The amount of oil required to foul Lake Erie is not great. In 1958, the wrecking of one small barge near Gary, Indiana, resulted in the covering of 200 miles of Lake Michigan beach with black, tarry oil.²¹⁰ Any oil drilling in Lake Erie exposes the Lake to possible pollution that could speed its death. Currently Ontario is the only active offshore oil producer. During 1967, 32 wells were drilled offshore and 14 were completed as oil producers.²¹¹

Recently Ohio moved to allow drilling and guideline regula-

²⁰⁵ LEAGUE OF WOMEN VOTERS, LAKE ERIE BASIN COMMITTEE, LAKE ERIE — REQUIEM OR REPRIEVE? 27 (1966).

²⁰⁶ See, e.g., UNITED NATIONS, POLLUTION OF THE SEA BY OIL (1956); Stubbs, *Oil Pollution: Penalty and Damage Aspects*, JAG J. 140 (Oct. 1962) (Navy).

²⁰⁷ Oil Pollution Act of 1924, 33 U.S.C. § 431 (1964), as amended, 80 Stat. 1246 (1966).

²⁰⁸ See generally *Hearings on S. 1591 and S. 1604 before the Subcomm. on Air and Water Pollution of the Comm. On Public Works*, 90th Cong., 1st Sess., pt. 1 (1967).

²⁰⁹ This, however, is a problem which technology is vigorously attempting to solve. See Benedict, *Firms Fight Problem of Oil Spills at Sea, Trying Everything From Talc to Chemicals*, Wall Street Journal, May 17, 1968, at 28, col. 1.

The FWPCA admitted that "methods of coping with oil pollution after a discharge, either locally or basin-wide, are not now adequate. . . . The possibility of a major cargo spillage within the lake proper is real and poses a disastrous threat to the entire lake." LAKE ERIE REPORT, *supra* note 5, at 59.

²¹⁰ Adams, *Water Pollution Control In The Great Lakes Region*, 37 U. DET. L.J. 96, 97 (1959). A danger to Lake Michigan is presented by the abandoned tramp freighter *Francisco Morazon* grounded in Lake Michigan in November 1960.

Because of 6,500 gallons of fuel oil in the bottom tanks of the wrecked vessel, lying within view of the famed Sleeping Bear Dunes, Michigan's Attorney General Frank J. Kelley filed suit in a county circuit court on August 16, 1968, declaring the wreck a nuisance and requesting the court to order the owners to remove the oil and the ship. If this is not done, the state has asked for authority to take such action and charge the owners for the expenses involved.

[The m]ain concern is the possibility of the 247-foot hulk . . . producing a mini-Torrey Canyon incident. Contributing further to such prospects, on August 28[, 1968,] the Morazon caught fire — cause unknown — and the superstructure was ablaze for some six hours. However, the heavy fuel oil, deep in the hull, remains as a threat to the lake and its beaches. 12 GREAT LAKES NEWSLETTER, NO. 6, at 6 (July-Aug. 1968).

²¹¹ 12 GREAT LAKES NEWSLETTER, *supra* note 191.

tions were issued.²¹² However, at the request of the Ohio legislature, the issuance of leases for drilling in Lake Erie was postponed indefinitely.²¹³ At present all states have postponed the granting of drilling leases with the exception of Pennsylvania. Pennsylvania claimed that Ontario has allowed drilling for 50 years, that this has resulted in no pollution, and that the leases they plan to issue are very strict.²¹⁴ The City of Erie, Pennsylvania disagreed, and tried unsuccessfully to prevent the granting of leases through court action.²¹⁵ Strict leases are, of course, better than leases that do not encourage pollution-free operations. However, spills can not be prevented.

If accidents can occur after the precautions taken in manned space flight operations, they can occur in oil drilling operations. Indeed, the pollution may also result from planned actions. In the past two years, 22 explosions, which caused damage of \$1 million to equipment used in oil drilling, occurred during a labor organization conflict in Louisiana.²¹⁶ If such an explosion ruptured a pipe under the surface of the Lake, the water supply of communities in the basin could be seriously impaired. The effect on wildlife and on the oxygen content of the water could be most undesirable. This writer knows of no offshore drilling operations anywhere in the world that have not resulted in pollution. But even if the oil companies could operate without pollution, the danger of a major accident is always present.

In 1966 there were 747 reported oil spills on United States waters.²¹⁷ The number of additional, unreported spills is, of course, unknown. Pollution by the petroleum industry that year

²¹² By the State of Ohio, Department of Natural Resources, Division of Oil and Gas.

²¹³ H.R. 176, 107th Gen. Assembly; H.R. 206, 108th Gen. Assembly; S.R. 123 and 139.

²¹⁴ Testimony of Walter Lyon before the FWPCA Enforcement Conference, *supra* note 163.

Apparently the FWPCA also concurs with Pennsylvania's thinking that oil pollution if forbidden by law will not occur. They stated:

If considerable quantities of oil are encountered in drilling, the risk of oil pollution will be of the highest degree with the potential existing for a disaster. The guaranteed protection from such happenings is absolutely mandatory. Therefore, the States and drilling companies should provide controls that guarantee the complete absence of oil from the lake. LAKE ERIE REPORT, *supra* note 5, at 81.

Such naiveté is indefensible.

²¹⁵ The City of Erie has opposed this drilling in a commonwealth court but their petition was dismissed. 12 GREAT LAKES NEWSLETTER No. 4 (Mar.-Apr. 1968).

²¹⁶ See NEWSWEEK, Jan. 8, 1968, at 55.

²¹⁷ NATIONAL FISHERMAN, Jan. 1968.

killed 154,000 fish, with oil in transit responsible for additional fish deaths.²¹⁸ There are about 2000 oil drilling rigs in operation off the coast of Louisiana, and it is claimed they all are releasing oil into the Gulf of Mexico. In November 1967, a pipeline on the Gulf floor broke and released 5 million gallons of oil.²¹⁹ The United States Fish and Wildlife Service and the Alaska Department of Fish and Game worry that a 25 barrel oil spill could cause a large wildlife kill.²²⁰ They have reason to worry, for in November 1967 thousands of ducks were killed from an oil spill related to drilling in Alaska's Cook Inlet.²²¹ The continuing oil pollution in Bristol Bay, Alaska has caused local fishermen to oppose continued drilling.²²² In December 1967, a tanker crashed into a loading facility in the Cook Inlet and lost more than 60,000 gallons, creating a slick 70 miles long and 15 miles wide.²²³ In 1966 there were 68 instances of oil spillage and refuse dumping reported in Cook Inlet. In 1967 there were 40 incidents.²²⁴ As a result of this repeated and continuing pollution, a resolution was introduced in the Alaska Senate calling for the halt of all offshore oil and gas leasing in Alaska until pollution problems are corrected.²²⁵

With oil drilling offering a great deal of harm to the environment and very little benefit, why does Pennsylvania insist on allowing such drilling when all other basin states have rejected the opportunity to grant oil leases? The answer of course is money. But, money for whom? A few oil companies aided by the enlightened legislators of Pennsylvania may give the Lake Erie Basin citizenry the opportunity to see a new form of pollution administer the *coup de grace* to an already very sick lake.

H. Lead Poisons

In the 19th century, lead poisoning in the United States from

²¹⁸ U.S. DEP'T OF INTERIOR, FWPCA, FISH KILLS BY POLLUTION 1966, Table 4 (1967).

²¹⁹ OCEANOLOGY INT'L, Jan.-Feb. 1968, at 16.

²²⁰ Brennan, *Experts Seek Solution To Inlet Pollution Problem*, Anchorage Daily Times, Dec. 14, 1967, at 17.

²²¹ See generally Brennan, *Lethal Oil Continues To Kill Inlet Ducks*, Anchorage Times, Dec. 1, 1967, at 1; Smith, *Oil-Soaked Ducks Dying Along Inlet*, Anchorage Daily News, Nov. 26, 1967; Anchorage Daily News, Nov. 27, 1967, at 2.

²²² Wiese, *Bristol Bay Oil Causes Concern*, Anchorage Daily News, Dec. 18, 1967.

²²³ Cheechako News, Kenai Peninsula, Alaska, Jan. 5, 1968.

²²⁴ Anchorage Daily News, Jan. 29, 1968.

²²⁵ Anchorage Daily News, Jan. 30, 1968.

the use of lead water pipes was not unusual.²²⁶ Lead poisoning from lead drinking vessels dates back to the days of the Roman Empire²²⁷ and even today may occur from improperly glazed pottery.

Today, the lead concentration in the blood of United States residents averages about one part per million, or about 100 times its natural level and about one-half the level required for "classic" lead poisoning.²²⁸ In the early stages the vagueness of the symptoms, being similar to "tired blood" or migraine headaches, makes diagnosis difficult even if the afflicted person seeks treatment.²²⁹

The source of this lead is automobile fumes that enter the human body in drinking water.²³⁰ From the introduction of lead into gasoline in 1923, elaborate tests persuaded official bodies that as an air pollutant, lead in the exhaust of automobiles was not concentrated enough to be dangerous. It was not recognized that such lead was being washed into water courses. Now the lead content of United States surface waters is close to 10 milligrams per cubic yard.²³¹ Unfortunately, nothing is being done about this pollutant.²³²

I. *Gross Matter*

Along the Cleveland waterfront, a city owned truck pushes old car bodies out onto the ice of Lake Erie. These cars were picked up off the street, and without any change in condition (that is, complete with engine, tires, oil, gasoline and grease) they are pushed onto the ice. When the ice melts, they sink into the Lake.²³³

Gross matter as a pollutant can be virtually any tangible substance a person can get into the water. To some extent, placing this matter into navigable streams is prohibited by federal legisla-

²²⁶ E. MURPHY, *WATER PURITY* 21 (1961).

²²⁷ Lead poisoning caused sterility in Ancient Rome and was partially causative of the decline of that civilization. *Lead Among the Romans*, *TIME*, Sept. 23, 1966, at 79.

²²⁸ D. CARR, *DEATH OF THE SWEET WATERS* (1966).

²²⁹ *Id.* at 187-88.

²³⁰ U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, *OCCUPATIONAL DISEASES* 245 (W. Gafafer ed. 1966).

²³¹ R. RIENOW & L. RIENOW, *MOMENT IN THE SUN* 195 (1966).

²³² Occasionally interest is generated in lead poisoning when it kills wildlife. See J. LINDUSKA, *WATERFOWL TOMORROW* 479 (1964); Knap, *Lead Poisoning in Water Fowl*, *THE AM. RIFLEMAN*, May 1967, at 26.

²³³ U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, *CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES* 606 (Aug. 1965).

tion, but enforcement of this legislation is virtually non-existent.²³⁴ Ohio recently passed a law prohibiting the placement of gross matter in any water course or on its bank, but, no government body was given specific responsibility for enforcing the law, nor were any funds provided for its enforcement.²³⁵ This is the Ohio way of abating pollution. Any person who wishes to gather a ton of debris from the shore of Lake Erie could do so in a day if he had the physical stamina. He would not have to walk very far. What would happen if the state made it unlawful to put debris on the Ohio Turnpike but provided no maintenance men to keep it clean? This is exactly what is being done with Lake Erie.

J. Radioactive Substances

Pollution caused by radioactive material entering the Lake is like oil well pollution — a potential threat with the possibility of but one accident causing incalculable harm. Radioactive substances have not been a problem in Lake Erie but they could become important as proposed nuclear power plants are placed in operation in the Lake Erie Basin. Further, indirect contamination from the air due to nuclear testing, particularly if large scale testing of nuclear weapons is resumed, is also a continuous threat.^{235a}

It would be a mistake to assume that accidents involving radioactive materials do not occur. One reactor accident occurred in 1957 at Widschak, England. Vaporized fission products, mostly radioactive iodine-131, were distributed as far away as Denmark. In a 200 square mile area, 240,000 gallons of milk had to be

²³⁴ The primary statute is the Rivers and Harbors Act of 1899, 33 U.S.C. § 407 (1964).

²³⁵ OHIO REV. CODE ANN. § 3767.32 (Page Supp. 1966). See also 20 OHIO'S HEALTH 1 (Jan. 1968).

The FWPCA reported: "Since Lake Erie has been considered a good disposal site for anything, there are few kinds of waste which cannot be found in it. *Trash and debris, for example, can be seen almost anywhere along the lakeshore.*" LAKE ERIE REPORT, *supra* note 5, at 35 (emphasis in original). "Fallen trees and stumps choke rivers and streams at many places, blocking flow and collecting floating materials. During high flows the debris is flushed downstream to harbor areas and to the lake where it interferes with commercial navigation and small boating." *Id.* at 58.

^{235a} Thus the FWPCA reported:

The content in Lake Erie of radioactive wastes is increasing, primarily from atmospheric fallout, nuclear power plants, and from medical uses. Limits for discharge are set by the Atomic Energy Commission. The levels in Lake Erie and in tributaries are low and are not known to be harmful, but the substances are cumulative and lost only by long natural decay. Increasing conversion of the energy for electric power production from fossil to nuclear fuels indicates that radioactive waste levels will continue to rise. LAKE ERIE REPORT, *supra* note 5, at 63.

dumped due to contamination. In 1961 a reactor explosion in Idaho scattered radioactive dust over a 3-acre area, and iodine-131 was found as far away as Burley, located 90 miles to the southwest. In 1951 and 1952, a radioactive form of thorium leaked from an Atomic Energy Commission plant into the sewage system of Ames, Iowa, for more than a year. Radioactive sludge from the sewage plant was spread as fertilizer before the leak was discovered.²³⁶

The atomic power industry has an excellent safety record, but it must be perfect. As atomic devices enter more hands and are less subject to central government control, the danger will multiply. The disposition of the wastes from atomic installations will also be a continuing problem. In terms of content, 99.9 percent of these wastes come from processed reactor fuel.²³⁷ Handling this waste is difficult.²³⁸ The various underground disposal plans are frightening to comprehend²³⁹ for man's ignorance in this area precludes the safe use of these methods at this time.²⁴⁰

III. THE LEGAL RESPONSE

A. *The Administrative Agencies*

Since the beginning of our nation the federal government has been dealing with our water resources.²⁴¹ Until this century navigation improvements dominated the federal program.²⁴² During

²³⁶ Cloud, *Is Atomic Industry Risking Your Life?*, POPULAR SCI., June 1965, at 45.

²³⁷ C. MAWSON, MANAGEMENT OF RADIOACTIVE WASTES 16 (1965). See generally U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, ROUTINE SURVEILLANCE OF RADIOACTIVITY AROUND NUCLEAR FACILITIES (1966).

²³⁸ See Straub, *Environmental Problems Of The Atomic Energy Industry — High-Level Wastes*, SANITARY ENGINEERING ASPECTS OF THE ATOMIC ENERGY INDUSTRY (U.S. Atomic Energy Comm'n 1956).

²³⁹ See de Laguna, *Some Geologic Factors That Influence Disposal of Radioactive Wastes Into Pits*, in *id.*

²⁴⁰ Warner, *Deep Well Waste Injection — Reaction With Acquirer Water*, J. SANITARY ENGINEERING DIVISION 45 (American Society of Civil Engineers, Aug. 1966). For the story of the rupture of Hammermill Paper Company's Erie, Pennsylvania, underground waste pulp liquor storage, see Cleveland Plain Dealer, Apr. 17, 1968, at 12, col. 1. For a comprehensive discussion of the danger imposed by nuclear reactors see Green, "Reasonable Assurance" of "No Undue Risk", SCIENTIST AND CITIZEN 128 (June/July 1968).

²⁴¹ The first session of Congress, in 1789, passed an act providing that "a lighthouse shall be erected near the entrance of Chesapeake Bay." The federal government has been engaged in water development ever since that act. H. SMITH, THE POLITICS OF CONSERVATION I (1966).

²⁴² See generally Fly, *The Role of the Federal Government in the Conservation and Utilization of Water Resources*, 86 U. PA. L. REV. 274 (1938). Hines, *Nor Any Drop To Drink: Public Regulation of Water Quality, Part III: The Federal Effort*,

the Great Depression, river basin development for flood control, irrigation, and power generation became important activities.²⁴³ The federal government had the authority to control pollution²⁴⁴ but little proclivity to use this authority.²⁴⁵ Statutes dating to the 19th century prohibited pollution under navigation control,²⁴⁶ but it was not until the Water Pollution Control Act of 1948 that the government began to deal directly with the pollution problem.²⁴⁷ This program began as a 5-year experimental pollution control program but was extended by the 1950 Water Pollution Control Act.²⁴⁸ In 1956 amendments to the act provided federal grants to cities for sewage treatment plants, some limited enforcement power, and authorized research.²⁴⁹ In 1961 the Water Pollution Control Act was again amended to extend federal enforcement powers, liberalize the construction grants program, and to accelerate the research program.²⁵⁰

However, the serious attempt to reverse the deteriorating quality of Lake Erie began under the banner of the Federal Water Pollution Control Act,²⁵¹ subsequently amended by the Water Quality Act of 1965²⁵² and the Clean Water Restoration Act of 1966.²⁵³ In 1965 Governor Rhodes of Ohio requested a conference be called by the Secretary of Health, Education and Welfare under section 8

52 IOWA L. REV. 432 (1967); For a discussion of regional activity see Hines, *Nor Any Drop To Drink: Public Regulation Of Water Quality, Part II: Interstate Arrangements For Pollution Control*, 52 IOWA L. REV. 799 (1967).

²⁴³ See generally REPORT OF THE PRESIDENT'S WATER RESOURCES POLICY COMMISSION, 3 WATER RESOURCES LAW (1959); A. KING, *THE CONSERVATION FIGHT* (1959).

²⁴⁴ See generally J. BEUSCHER, *WATER RIGHTS* 320 (1967); F. TRELEASE, *WATER LAW* 310 (1967); Stern, *The Commerce Clause and the National Economy 1933-1946*, 59 HARV. L. REV. 645, 947 (1946); Trelease, *Federal Jurisdiction Over Water In the Eastern United States*, in *WATER RIGHTS CONFERENCE* (Mich. State Univ., March 1960).

²⁴⁵ ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS, INTERGOVERNMENTAL RELATIONS SUBCOMMITTEE OF THE HOUSE COMMITTEE ON GOVERNMENT OPERATIONS, INTERGOVERNMENTAL RESPONSIBILITIES FOR WATER SUPPLY AND SEWAGE DISPOSAL IN METROPOLITAN AREAS (1962); *Hearings on S. 890 and H.R. 9540 Before the Subcomm. on Rivers and Harbors of the House Comm. on Public Works*, 84th Cong., 1st & 2d Sess. (1956).

²⁴⁶ See, e.g., Act of Aug. 18, 1894, ch. 299, §§ 6-8, 28 Stat. 363.

²⁴⁷ 33 U.S.C. § 466 (1964).

²⁴⁸ Water Pollution Control Act Extension, *id.* § 466(f).

²⁴⁹ *Id.* § 466 (K).

²⁵⁰ *Id.* § 466(i).

²⁵¹ *Id.* § 466.

²⁵² 26 *Id.* § 4911.

²⁵³ 33 *Id.* § 466.

of the Federal Water Pollution Control Act.²⁵⁴ The result of this conference was the *Revised Conclusions and Recommendations of the Conferees*.²⁵⁵ This report contained 27 findings of which 20 were specific calls for action to abate pollution. There have been followup conferences in 1966, 1967, and 1968 to determine the progress being made toward meeting the goals set forth by the 1965 conference.

The FWPCA has approached the pollution problem primarily from an effluent control viewpoint. Recommendations have been made in terms of controlling the pollutants entering the waterways. At the same time states have been required to set water quality standards for their navigable waterways. Their controls emphasize maintaining the quality of the water courses and, thus, indirectly controlling effluents. By federal law if the standards do not meet the approval of either the Secretary of the Interior or the Governor of the state, the standards may be set by the former.²⁵⁶

²⁵⁴ *Id.* § 466(g). However, previously,

[i]n 1961 the Governor of Michigan requested a State-Federal intrastate enforcement conference on the Michigan waters of the Lake Erie basin. At this conference, binding pollution abatement agreements and remedial schedules were established for 11 units of municipal government and 25 industries in Michigan. LAKE ERIE REPORT, *supra* note 5, at 67.

The 1965 conference was held August 3-6, with Mr. Murry Stein, Chief, Enforcement Branch, Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare, presiding. Reorganization Plan No. 2 of 1966, 31 Fed. Reg. 6857 (1966), transferred this organization to the Department of Interior where it is now the Federal Water Pollution Control Administration (FWPCA).

²⁵⁵ REVISED CONCLUSIONS AND RECOMMENDATIONS OF THE CONFEREES, CONFERENCE ON POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES (Aug. 12, 1965). The FWPCA in their 1968 *Lake Erie Report* stated that:

Michigan, Indiana, Ohio, Pennsylvania, and New York should pursue diligently and expeditiously (a) the requirements of the enforcement conference, (b) their plans of implementation designed to achieve the water quality standards for Lake Erie, and (c) the additional recommendations specified in this report. LAKE ERIE REPORT, *supra* note 5, at 12 (emphasis in original).

Some of the elements added by (c) above include:

1. The need for defining long-range pollution control programs necessary to maintain high quality water in Lake Erie after standards have been implemented.
2. International cooperation from the Canadian Province of Ontario and its role in the remedial pollution control program for Lake Erie.
3. Recognition of certain problems such as oil and gas well drilling in the lake.
4. Numerous areas where large scale research and development is needed to aid in the restoration of the lake.
5. Programs to bring about the centralization of sewerage systems to control water pollution on a metropolitan or area-wide basis.
6. Requirements for control of intrastate in addition to interstate pollution.

Id.

See also *Id.* at 69.

²⁵⁶ 33 U.S.C. § 466 (g) (c) (2) (1964).

In establishing such standards the state authority must take into consideration the waters' use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses.²⁵⁷ The Department of the Interior has drawn policy guidelines. The most important are that existing quality must be maintained, the water cannot be used principally for transporting wastes, and no wastes amenable to treatment or control shall be discharged without the needed treatment or control.²⁵⁸ These policy guidelines were reemphasized by Secretary of the Interior Stewart Udall in his testimony before the Senate Subcommittee on Air and Water Pollution March 27, 1968 as being the basis for federal evaluation of state plans.

Ohio has responded with regulations adopted by the Water Pollution Control Board.²⁵⁹ The regulations were adopted June 14, 1966, and were amended October 10, 1967. These regulations contain seven *Water Quality* criteria categories: *Public Water Supply*; *Industrial Water Supply*; *Aquatic Life A*; *Aquatic Life B*; *Recreation*; *Agricultural Use and Stock Watering*; and *Cold Water Fisheries*. Nine scientific tests are used to determine water quality: bacteria, threshold-odor, dissolved solids, radioactivity, chemical constituents, dissolved oxygen, acidity-alkalinity ratio (pH), temperature, and toxic substances. However, no single criteria category applies more than five of these tests. In addition, the four general minimum conditions applicable to all waters at all places and at all times are that the water be:

1. Free from substances . . . that will settle to forms putrescent or otherwise objectionable sludge deposits.
2. Free from floating debris, oil, scum and other floating materials
3. Free from materials . . . producing color, odor or other conditions in such degree as to create a nuisance.
4. Free from substances . . . which are toxic²⁶⁰

These criteria are similar to those used by the Ohio River Valley Water Sanitation Commission,²⁶¹ an interstate compact organization

²⁵⁷ *Id.* § 466 (g) (c) (3).

²⁵⁸ U.S. DEP'T OF INTERIOR, FWPCA, GUIDELINES FOR ESTABLISHING WATER QUALITY STANDARDS FOR INTERSTATE WATERS (1967).

²⁵⁹ The OWPCB is established in the Department of Health, OHIO REV. CODE ANN. § 6111.02 (Page 1953). In 1967 a sixth member — the Director of the Ohio Department of Agriculture was added to the Board. The other members are the Director of Health, the State Commerce Director, Director of Natural Resources, and two appointed members representing municipalities and industry.

²⁶⁰ Regulations of the OWPCB.

²⁶¹ OHIO RIVER VALLEY WATER SANITATION COMMISSION ANN. REP. 10 (1966).

of which Ohio is a member.²⁶² This organization has worked for some time at improving the Ohio River Basin and is primarily deserving of credit for the fact that the Ohio River's water is of much higher quality than those rivers in northern Ohio draining into Lake Erie.²⁶³

These criteria apply to intrastate as well as interstate waters.²⁶⁴ The harbor areas of Lake Erie at Cleveland, Lorain, and Ashtabula have been zoned for the lowest criteria, the Industrial Water Supply and a well-balanced warm-water fish population.²⁶⁵ As fish cannot live in water of industrial quality the latter requirement is unlikely to be met.²⁶⁶ Not all intrastate waters have been zoned so as to require each part of the water course to meet the requirements of one of the *Water Quality* criteria. Standards for the Cuyahoga,

²⁶² OHIO REV. CODE ANN. § 6113 (Page 1953).

²⁶³ See generally E. Cleary, *THE ORSANCO STORY — WATER QUALITY MANAGEMENT IN THE OHIO VALLEY UNDER AN INTERSTATE COMPACT* (1967).

²⁶⁴ OWPCB, *CLEAN WATERS FOR OHIO 2* (Fall 1967).

For intrastate waters in the basin, water quality standards are not a direct requirement under the Federal Water Pollution Control Act. The Act, however, does contain provisions which make it advantageous to the States to also promulgate standards for these waters. All of the Lake Erie States recognize these advantages — i.e., the resulting larger contributions of Federal construction grant funds — and are in the process of establishing enforceable standards for intrastate streams.

New York has had a system of standards for all of its waters and is now pledged to a continuing program of upgrading and improving the classification system and associated criteria.

Pennsylvania in 1944 adopted a classification system for all of its streams. These have been subjected to periodic review and upgrading, where necessary. The State has indicated that this updating will continue, with priority on updating streams which at present are adversely affected by pollution.

Michigan has adopted intrastate standards which are similar to the interstate standards and is now in the process of establishing water uses for the streams. *LAKE ERIE REPORT*, *supra* note 5, at 71-2.

The weakness of intrastate pollution controls led the FWPCA to state:

The water quality programs of some of the states do not consider areas where more positive control over certain waste sources is required. These include wastes from marinas and vessels, dredging operations, mining operations, feed lots, agricultural runoff, and flood plain zoning. These omissions indicate the necessity for changes in the State programs or statutes to permit more efficient control of all sources of water pollution.

In a similar vein, enabling legislation should be sought which would provide for the establishment of effective methods of dealing with the complexity of problems in the metropolitan areas of the basin. The State pollution control agencies should provide the leadership in these areas in relating waste treatment to the broader planning of the total urban environment. *Id.* at 79.

²⁶⁵ OWPCB, *CLEAN WATER FOR OHIO 2* (Spring & Summer eds. 1967).

²⁶⁶ See Doudoroff & Warren, *Dissolved Oxygen Requirements of Fishes*, in *BIOLOGICAL PROBLEMS IN WATER POLLUTION* 145 (U.S. Dep't of Health, Educ. and Welfare 1962).

Chagrin, Rocky and Grand Rivers should be announced in the fall of 1968.²⁶⁷

These water criteria can be criticized for two reasons. First, the philosophy of multiple categories of various quality levels of water is based upon the assumption that water need not be pure. With seven categories of descending levels of water the lowest quality of water is very low. Pragmatic considerations may require such categories as a temporary expedient as we move toward higher water quality by abolishing low-quality criteria, but no mention to this writer's knowledge has ever been made in Ohio by any official that this was a governmental goal. Rather, a system of water zoning has been created that legitimatizes continued low-quality water. Future water uses include the continued pollution of our waterways by industry.²⁶⁸ Particularly appalling is the frequent application made by the state of the lowest quality standard of water, the *Industrial Water Supply* criterion, which is unfit for any non-industrial use. Second, each criterion uses only some of the nine scientific tests and does so in a manner that creates vague and inconsistent criteria making it difficult if not impossible to determine whether one criterion is requiring higher quality water than another. Thus, the *Public Water Supply* criterion has no limitation on pH or temperature and applies only the general limitations on toxic substances. The *Recreation* criterion has only a bacteria limitation. The *Agricultural Use and Stock Watering* criterion places no limitation on any of the nine items enumerated but merely repeats the general "minimum conditions applicable to all waters at

²⁶⁷ Letter to the author from Mr. G.A. Hill, Engineer-Secretary of the OWPCB.

²⁶⁸ The *Report on Water Quality and Use, Three Rivers Watershed District* (1966) stated: "As long as water suitable for recreation, for fish habitat, or for public water supplies, is conveniently available in sufficient quantities, from other sources, it may be in the best interest of the public to use these rivers, or certain reaches of them, for purposes allowing lower quality standards." STANLEY ENGINEERING CO., REPORT ON WATER QUALITY AND USE, THREE RIVERS WATERSHED DISTRICT 4 (1966) (prepared for the Lake Erie Watershed Conservation Foundation). Thus, water quality standards are to be used to maintain degradation.

The idea that water should be "zoned" for industry and thus be allowed to be of low quality is unwarranted. Kimberly-Clark Paper Co. spent upward of 10 percent of its \$20 million investment in building a new mill for waste treatment equipment. This was necessary to meet California's standards for the Sacramento River. Now baby salmon, which are more sensitive than humans, can live in the company's waste effluent. See Hill, *The Politics of Pollution*, 201 THE NATION 220 (1965).

The Eastman Kodak Company is working on treatment facilities that will allow the Genesee River in New York to meet state's "B" classification which allows fish life and recreational uses involving full body contact. 21 KODAK HIGHLIGHTS 7 (May 1968).

all places and at all times."²⁶⁹ The following conditions would meet Ohio's water quality criteria for the following categories:

Public Water Supply — Water polluted with mine acid runoff.

Aquatic Life A — Bacteria content so high that any body contact, even with the hands, would be dangerous.

Recreation — Water skiing in an effluent of hot pickling acid.

The *Industrial Water Supply* and *Aquatic Life B* criteria are very similar. Dissolved Oxygen, pH, and temperature limitations are the same. The *Industrial* category places a limit on dissolved solids; *Aquatic Life B* does not. Rather, it has a limitation on toxic substances which presumably is already covered by the four minimum conditions applicable to all seven criteria.

Fish cannot live in water of *Aquatic Life B* quality.²⁷⁰ Why is such a category chosen? The answer is that the establishment of this category gives an illusion of progress. For example, Ohio's Division of Engineering of the Department of Health in its recommendations to the Ohio Water Pollution Control Board in May 1968, recommended that the Cuyahoga River from the State Highway Bridge Number 17 to the United States Coast Guard Station should meet *Industrial Water Supply* criterion not later than January 1, 1971 and should meet *Aquatic Life B* by January 1, 1975. This may sound as though the state is demanding progress. In reality, no improvement need be made in the second 4-year period. In 1975, assuming all requirements are met, fish still will not be able to live in the Lower Cuyahoga River, nor will the river be suitable for any other non-industrial use.

Most activity directed toward the abatement of pollution in Lake Erie involves the actions of the FWPCA or the state water pollution boards.²⁷¹ There are, however, other legal standards that can be the basis for pollution abatement remedies.

As Lake Erie is contiguous to Canada as well as the United

²⁶⁹ See text accompanying note 260 *supra*. Some of this criticism is alleviated by applying more than one criterion to a given body of water but the vagueness and confusion engendered remains subject to criticism.

²⁷⁰ Doudoroff & Warren, *supra* note 266, at 147.

²⁷¹ Once state standards are accepted by the Secretary of the Interior, they become federal as well as state standards, and the same standard may be enforced by either body. The Federal government has a choice of two abatement procedures. 33 U.S.C. § 466g(d)-(h) provides a cumbersome remedy that takes more than a year to achieve the filing of an injunction suit. However, under 33 U.S.C. § 466g(c)(5), added in 1965, when established water quality standards are violated, abatement actions may be brought on 180 days notice without the administrative procedures required under the older procedure.

States, international law plays a part in pollution control. In 1909 a treaty between the United States and Great Britain provided in Article IV that: "It is further agreed that the waters herein defined as boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property of the other."²⁷²

A private citizen has almost no rights under the treaty.²⁷³ He can only request that his own government refer the matter to the International Joint Commission. This is an autonomous body of three American and three Canadian members created under Article VII of the treaty. This body has no judicial powers nor does it have administrative or enforcement powers.²⁷⁴ The Commission investigates and makes recommendations. It can summon witnesses and hold public hearings. The usual procedure is for the commission to appoint technical advisory boards to direct the field investigations and make technical findings. Then the report and recommendations of the commission are prepared.²⁷⁵ Existing evidence indicates that both countries are polluting the Lake. Evidence also indicates that the United States is much more derelict.²⁷⁶ Only if pollution by one of the two countries becomes materially greater than the other and causes serious direct harm to the non-pollutor could we expect the treaty to be utilized by the injured nation to achieve some meaningful abatement action.²⁷⁷ In 1918 the first International Joint

²⁷² Treaty with Great Britain on Boundary Waters between the United States and Canada, Jan. 11, 1909, art. IV, 36 Stat. 2448 (1909) (effective May 13, 1910).

²⁷³ See generally Sutherland, *Restricting the Treaty Power*, 65 HARV. L. REV. 1305 (1952).

²⁷⁴ Erichsen & Brown, *Legal Implications of Boundary Water Pollution*, 17 BUFFALO L. REV. 65 (1967).

²⁷⁵ INTERNATIONAL JOINT COMMISSION, SAFEGUARDING BOUNDARY WATER QUALITY 16 (1961).

²⁷⁶ INTERNATIONAL JOINT COMMISSION REPORT ON THE POLLUTION OF BOUNDARY WATERS 20, 221 (1951). Several recent conferences have had Canadian speakers who did not specifically mention the subject but from their remarks is the implicit message that both countries are polluters. See Coverly, *Water Quality Management in the Great Lakes States and Ontario*, in STATEMENTS AT THE ANNUAL MEETING OF THE GREAT LAKES COMMISSION 40 (1966); Roseborough, *Observation of Your Great Lakes Neighbors*, in THE GREAT LAKES — HOW MANY MASTERS CAN THEY SERVE? 43 (Mich. Natural Resources Council 1966); Langford, *Some Aspects of the Great Lakes Pollution Problems*, in UNITED ACTION FOR CLEAR WATER CONFERENCE, U.A.W. (1965).

²⁷⁷ The FWPCA remains more sanguine and reports:

Successful and total clean-up of Lake Erie's present pollution and effective management of its future water quality will require U.S.-Canadian agreements and cooperation. Indications that such will be forthcoming are available in Canadian and United States assent to and participation in an investigation of pollution in Lake Erie now underway by the International

Commission report found conditions "chaotic and disgraceful." Twenty-eight years later, in 1946, it made another study. It took 16 years after the 1950 formulation of water quality objectives for boundary channels for any compliance to be seen.²⁷⁸ Thus, the International Joint Committee has not been especially effective.

Under the Federal Water Pollution Control Act, the Department of the Interior at the request of the Secretary of State can initiate abatement proceedings, if pollution in the United States endangers people in foreign countries, provided that the foreign country extends reciprocal rights. To this writer's knowledge, this power has never been exercised.

If pollution of Lake Erie is to be abated it will be accomplished through administrative agencies at both the federal and state levels of government. The FWPCA is, as we have seen, the primary federal agency. However, the Soil Conservation Service through the Watershed Protection and Flood Prevention Act²⁷⁹ is active in watershed projects smaller than 250,000 acres and not exceeding 25,000 square-feet of storage capacity.²⁸⁰ The larger flood-control projects which today include much more than technical flood control are handled through the United States Army Corps of Engineers.²⁸¹ This group is also very important in the

Joint Commission (IJC). This investigation, requested jointly by the Governments of Canada and the United States in 1964, will culminate in a report from the IJC which will include recommendations for needed remedial measures in both countries.

Acceptance and adoption of the report, which is scheduled for completion in 1969 by the two nations, thus would launch a joint coordinated and unprecedented U.S. and Canadian program to manage Lake Erie's water quality. LAKE ERIE REPORT, *supra* note 5, at 9 (emphasis in original).

Apparently a five year wait for a report does not discourage this agency. See generally L. BLOOMFIELD & G. FITZGERALD, BOUNDARY WATERS PROBLEMS OF CANADA AND THE UNITED STATES (1958).

²⁷⁸ U.S. DEP'T OF INTERIOR, FWPCA CONFERENCE PROCEEDINGS POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES, No. 1, at 25 (March 22, 1967); 33 U.S.C. § 466g(d)(2).

²⁷⁹ 16 U.S.C. §§ 1001-09 (1964).

²⁸⁰ See generally U.S. DEP'T AGRICULTURE, DEPARTMENT OF AGRICULTURES ROLE IN RESOURCE CONSERVATION (1966); U.S. DEP'T AGRICULTURE SOIL CONSERVATION SERVICE, DEVELOPING OHIO WATERSHEDS THROUGH PUBLIC LAW 566 (1963).

²⁸¹ When Congress makes funds available for construction the Corps of Engineers prepares plans and specifications, awards contracts and supervises construction. The completed projects may be operated and maintained by the Corps or they may be transferred to another agency or to local interests to operate and maintain.

Congress has provided general authority in several laws that permits the Secretary of the Army and the Chief of Engineers to authorize projects of limited scope within fiscal year appropriations specified in the laws. These general authorities are described briefly below.

Lake Erie Basin for its activities relating to channel improvement.²⁸²

At the state level in Ohio the Water Pollution Control Board of the Department of Health has jurisdiction over water quality

Small Navigation Projects (Section 107, River and Harbor Act of 1960, as amended). This legislation authorizes the Corps of Engineers authorized by Congress when they will result in substantial benefits to navigation. The Federal share in such projects may not exceed \$500,000 and the projects must be complete in themselves and not commit the United States to any additional improvement to insure successful operation. Such projects are also subject to the same requirements of feasibility and economic justification as the larger projects which require specific authorization by Congress.

Small Flood Control Projects (Section 205, Flood Control Act of 1948 as amended). This legislation provides for construction of small flood control projects not specifically authorized by Congress when, in the opinion of the Chief of Engineers, such work is advisable. The Federal share in such projects may not exceed \$1,000,000 and must constitute a complete solution to the flood problem involved so as not to commit the United States to additional improvements to insure effective operation. Such projects are subject to the same requirements of feasibility and economic justification as the larger projects which require specific authorization by Congress.

Small Beach Erosion Control Projects (Section 103, River and Harbor Act of 1962 as amended). This legislation provides for construction of small shore and beach restoration and protection projects not specifically authorized by Congress, when, in the opinion of the Chief of Engineers, such works are advisable. The Federal share in such projects may not exceed \$500,000. The projects must be complete in themselves and not commit the United States to any additional improvement to insure successful operation. Such projects are subject to similar requirements of feasibility, economic justification, and cost sharing as the larger beach erosion control projects which require specific authorization by Congress.

Emergency Bank Protection (Section 14, Flood Control Act of 1946). Under this authority the Corps of Engineers may spend up to \$50,000 in one locality during any one fiscal year for the construction of emergency bank-protection works to prevent flood damage to highways, bridge approaches, and other public works endangered by bank erosion. . . .

Flood Fighting, Repair, and Rescue Work (Public Law 99, 84th Congress). This law requires the Corps of Engineers to engage in flood fighting and rescue operations, and to repair or restore any flood control work threatened or destroyed by flood. In addition (Section 206, Flood Control Act of 1962), the Corps of Engineers may provide emergency protection for Federally authorized hurricane and shore protection projects when threatened, and repair and restore such works when damaged or destroyed by wind, wave, or water action of other than ordinary nature.

Flood Plain Information Studies (Section 206, Flood Control Act of 1960 as amended). This legislation provides authority to compile and disseminate information to states and local communities, upon their request, to aid them in providing for use and regulation of flood plain areas. The work to be done by the Corps under this authority involves surveying and mapping of flood plain areas, together with hydrology and frequency studies necessary to establish the flood damage potential, flood heights, and the extent of inundation of the areas involved. Such information is provided to aid local interests in establishing right-of-way lines, stream clearance lines, and land use regulations. U.S. ARMY CORPS OF ENGINEERS, WATER RESOURCES DEVELOPMENT IN OHIO at ii (1967).

²⁸² Snagging and Clearing (Section 3, River and Harbor Act of 1945). This act authorized the Corps of Engineers to undertake emergency work to clear

standards.²⁸³ The Division of Engineering of the Department of Health makes the technical studies upon which most of the other groups predicate their activities.²⁸⁴ A substantial number of other state agencies are involved in Lake Erie problems. Water planning is handled by the Ohio Water Commission.²⁸⁵ The Water Management Section of the Division of Water²⁸⁶ in the Department of Natural Resources²⁸⁷ supervises the Northwest Ohio District and Northeast Ohio District, both of which are engaged in water resource development within the Lake Erie Basin. One Ohio conservancy district is active in water planning. This district, the Three River Watershed District (Rocky, Cuyahoga, and Chagrin Rivers), was formed in 1965 under the provisions of section 6105 of the *Ohio Revised Code*. It is closely affiliated with the Lake Erie Watershed Foundation, a private non-profit conservation organization which pays the salary of the secretary-treasurer of the board of the Watershed District. He is the only paid staff member. In 1966 the expenditures of the district were \$1,108.85, which demonstrates the extent of their activities.²⁸⁸ They are engaged in planning and participating in public water pollution hearings and similar activities. Apparently very materially influenced by industry, their position is generally far from that of the nationally known organizations interested in ending pollution.

There are two other comprehensive watershed planning agencies within the Lake Erie Basin. In Michigan, the Huron River Watershed Council was established in 1965 under Public Act 253 of the State of Michigan.²⁸⁹ In New York, the Erie-Niagara Basin

or remove unreasonable obstructions from rivers, harbors, and other waterways in the interest of navigation.

Snagging and Clearing (Section 208, Flood Control Act of 1954). The Corps of Engineers is authorized, under this act, to spend up to \$100,000 on any single tributary during any one fiscal year for removal of accumulated snags and other debris, and for the clearing and straightening of stream channels when, in the opinion of the Chief of Engineers, such work is definitely in the interest of flood control.

Removal of Wrecks and Obstructions (Public Law 189, 55th Congress). Under this law the Corps of Engineers is authorized to investigate wrecked vessels and other obstructions to navigation, and to insure removal at the expense of the owner, or under certain specific conditions, at the expense of the Federal Government. *Id.* at iii.

²⁸³ See OHIO REV. CODE ANN. § 6111.03 (Page Supp. 1967).

²⁸⁴ *Id.* § 3701.

²⁸⁵ *Id.* §§ 1525.01-.04.

²⁸⁶ *Id.* §§ 1521.01-.99.

²⁸⁷ *Id.* §§ 1521.01-.05.

²⁸⁸ THREE RIVERS WATERSHED DISTRICT, ANNUAL REPORT (1966).

²⁸⁹ HURON RIVER WATERSHED COUNCIL.

Regional Water Resources Planning and Development Board was established in 1963 under the New York State Conservation Law.²⁹⁰ The Maumee Watershed Conservancy District in Ohio serves not as a comprehensive planning agency but as a water management agency which plans specific development projects.²⁹¹

These are not all of the state and federal agencies involved in water planning in the Lake Erie Basin but they are the major bodies. Local government groups involved with sanitary districts²⁹² and sewer districts²⁹³ are, of course, important. A completely comprehensive list would include most government divisions and agencies.²⁹⁴

Attempting to serve as a planning agency for the various groups

²⁹⁰ See LEAGUE OF WOMEN VOTERS, LAKE ERIE BASIN COMMITTEE, LAKE ERIE BASIN REPORT, No. 1 (1968).

²⁹¹ *Id.*

²⁹² OHIO REV. CODE ANN. § 6115.01 (Page Supp. 1967).

²⁹³ *Id.* §§ 6117.01-251.

One of the recommendations of the FWPCA is that the proliferous construction of small sewage plants should be halted. The use of metropolitan treatment plants and regional interceptors in accordance with treatment needs is recommended. LAKE ERIE REPORT, *supra* note 5, at 77.

²⁹⁴ See REPORT OF THE LEAGUE OF WOMEN VOTERS, CUYAHOGA COUNTY INTER-LEAGUE COUNCIL 31 (Jan. 26, 1966); Comment, *Role of Local Government in Water Law*, 1959, WIS. L. REV. 117.

One of the key recommendations of the FWPCA in its *Lake Erie Report* is that the multiplicity of governmental units dealing with Lake Erie be replaced by more comprehensive organizations.

The states have the responsibility and the authority now to accomplish the job, but they lack manpower and finances. However, a look ahead is needed to develop a single sophisticated water quality management and technological entity to replace the present division among five U.S. states, Canadian province, several Federal agencies, and literally hundreds of local governmental agencies and private interests. LAKE ERIE REPORT, *supra* note 5, at 82.

Each of the five Lake Erie states should encourage the adoption of area-wide sanitary authorities to control water pollution on a metropolitan basis. Such master planning and expanded area-wide control is currently needed in the metropolitan areas of Detroit, Michigan; Toledo, Akron, and Cleveland, Ohio; and Buffalo, New York. Id. at 13.

The intensity of pollution from the Greater Cleveland-Akron area ranks second only to that from Southeast Michigan — heavily populated and industrialized and *in great need of a master, areawide plan for pollution abatement*. However, unlike Southeast Michigan, this area has no such plan nor does any local agency exist to implement a regional plan.

The State of Ohio should develop a plan for this area using the approach taken in the development of the plan for Northwest Ohio. In addition, the following immediate steps should be taken to control pollution: 1. *The Cleveland and Akron areas should form metropolitan authorities and by 1990, when the areas merge, the two authorities should consolidate. Id.* at 75-77. *By the year 1990 most cities should be served by metropolitan area waste disposal systems. Exceptions will be cities located in remote reaches of the watershed where population is not expected to increase. Id.* at 13 (all emphasis in original).

involved in the water resource work in the Lake Erie Basin is The Great Lakes Basin Commission established in 1967 under the Federal Water Resources Planning Act of 1965.²⁹⁵ It is composed of representatives of Indiana, Michigan, Minnesota, Ohio, Wisconsin, Illinois, New York and Pennsylvania. Each of the federal departments or agencies involved has a member; the Departments of Agriculture, Commerce, Health, Education and Welfare, Housing and Urban Development, Interior, Justice, Transportation, the Army, and the Federal Power Commission. The chairman of this commission is appointed by the President.

The Great Lakes Basin Commission coordinates water resources developments, recommends development priorities, conducts water and land resource studies, and does the planning necessary to prepare a comprehensive regional plan.²⁹⁶ The Commission now is trying to formulate more specific goals and authority. It is also seeking additional finances which now come 50 percent from the federal government and the other 50 percent equally from the states.

Often confused with the Great Lakes Basin Commission is the Great Lakes Commission. This latter organization is not a planning agency, but serves as a clearing-house for information concerning the Great Lakes Basin. It was formed in 1955 as the basin states adopted the Great Lakes Basin Compact but this compact was only ratified by Congress in 1968.²⁹⁷ Now we can expect the functions of this organization to expand and this commission to evolve in a manner similar to other river basin commissions created by interstate compact.

B. *The Courts and Common Law Remedies*

Though Lake Erie will be cleaned up only through the activities

²⁹⁵ 33 U.S.C. § 466a(c) (1948), P.L. 89-80, 79 Stat. 244 (1965).

²⁹⁶ LAKE ERIE BASIN REPORT, *supra* note 290.

²⁹⁷ Senate Bill S. 660, which was signed by the President on July 24, 1968, grants consent of the Congress, with certain limiting qualifications, to the Great Lakes Basin Compact. Pub. L. No. 90-419, 82 Stat. 414 (1968). Eight states bordering on the Great Lakes have entered into the Compact.

Perhaps this commission will be utilized to carry out the FWPCA's recommendations that:

Municipal and industrial plant inspection, data gathering, and *monitoring activities of the Lake Erie states and the FWPCA should be coordinated* and expanded to maintain intimate knowledge of waste loadings, bypasses, treatment plant efficiencies, and illegal discharges in order that such information may be used in day-to-day water quality management. LAKE ERIE REPORT, *supra* note 5, at 16 (emphasis in original). The Great Lakes Basin Compact is found in OHIO REV. CODE ANN. §§ 6161.01-.03 (Page 1953).

of the previously discussed administrative agencies, it would be a mistake to think that the more traditional court enforced remedies are no longer available.²⁹⁸ Indeed, every reason exists to believe they will in the future increase in importance. The most venerable statutory authority still used for pollution abatement control is the Rivers and Harbors Act of 1899.²⁹⁹ The statute has two parts. The first part makes it unlawful to deposit from the shore any refuse matter into a navigable water of the United States. Refuse includes all pollutants,³⁰⁰ apart from the statutory exception granted for pollutants, "flowing from streets and sewers and passing therefrom in a liquid state" into a water course. Anything that has become waste even though useful and valuable is "refuse."³⁰¹ The second part of the statute makes it unlawful to deposit material on the bank of any navigable water where it may be washed into the water and impede navigation. The statute exempts the activities of the Army Corps of Engineers from both provisions. This statute may be expected to have continued use for in 1966 the United States Supreme Court found the Standard Oil Company criminally liable for accidentally allowing commercially valuable gasoline to be discharged into Florida's James River.³⁰² The quantity of proof necessary to meet scienter requirements is thus minimal. In addition to the criminal penalties of the Rivers and Harbors Act,³⁰³ any person who sustains a special injury due to violation of the Act may maintain an action for damages.³⁰⁴ The plaintiff, however, must show that the defendant failed to observe that degree of care which the circumstances demanded. The plaintiff cannot merely rely on the proof of violation of the federal Act.³⁰⁵

²⁹⁸ For a treatise on this subject, see Gindler, *Water Pollution and Quality Controls*, in 3 WATER AND WATER RIGHTS (R. Clark ed. 1967).

²⁹⁹ 33 U.S.C. § 407 (Supp. 1964).

³⁰⁰ *United States v. Standard Oil Co.*, 384 U.S. 224 (1966).

³⁰¹ *United States v. Ballard Oil Co.* 195 F.2d 369 (2d Cir. 1952).

³⁰² *United States v. Standard Oil Co.*, 384 U.S. 224 (1966).

³⁰³ 33 U.S.C. §§ 411, 412 (1964).

³⁰⁴ *Gulf Atlantic Transp. Co. v. Becker County Sand & Gravel Co.*, 122 F. Supp. 13 (E.D.N.C. 1954). This Act deals with discharges into the navigable waters of the United States. It is not applicable to the high seas. There is an International Convention for the Prevention of the Pollution of the Sea by Oil which the United States has entered with reservations. It forbids the dumping of oil within 50 miles of shore. The Treaty prohibitions apply only to the ships of those nations which have ratified it and only the nation of a particular ship's registry is authorized to punish for violations of the treaty. Birmingham, *The Federal Government and Air and Water Pollution*, 23 BUS. LAW. 467 (1968).

³⁰⁵ *Maier v. Publicker Commercial Alcohol Co.*, 62 F. Supp. 161 (E.D. Pa. 1945) *aff'd*, 154 F.2d 1020 (3d Cir. 1945).

Another act of potential importance is the Oil Pollution Act of 1924³⁰⁶ which is enforced by the United States Coast Guard.³⁰⁷ At present the act is of limited use as it exempts unavoidable accidents and collisions³⁰⁸ which makes proof difficult.³⁰⁹ The improper "discharge" is defined to limit the prohibited conduct to gross negligence or willful conduct,³¹⁰ further complicating proof. The Clean Waters Restoration Act of 1966³¹¹ amended the Oil Pollution Act of 1924³¹² to require any person³¹³ discharging oil from a vessel into the navigable waters of the United States, and adjoining shorelines, to remove the same. Failure to do so allows the Secretary of the Interior to arrange removal with the costs and penalties becoming a lien on the vessel.³¹⁴ The violator is subject to a fine of up to \$2,500 or one year imprisonment or both for each offense.³¹⁵ The boat, except if owned and operated by the United States, is liable for a penalty of up to \$10,000.³¹⁶ The Oil Pollution Act could, become of material importance in the fight to abate pollution if present proposed legislation becomes law. The proposed legislation removes the gross negligence/willful misconduct test and applies liability without fault, expecting only spillages due to acts of God.³¹⁷

The other statutes that can be used to effect pollution abatement are the various state water pollution control acts. In Ohio

³⁰⁶ 33 U.S.C. §§ 431-37 (Supp. II, 1965-66).

³⁰⁷ *Id.* § 436.

³⁰⁸ *Id.* § 433(a).

³⁰⁹ Section 7 of the Oil Pollution Act states that the act is in addition to other laws for the preservation and protection of navigable waters of the United States and should not be construed as repealing, modifying, or in any manner affecting the provision of such laws. *Id.* § 437. It is, therefore, easier to proceed under the less stringent proof requirements of the Rivers and Harbors Act, *id.* § 411. See also *United States v. Alaska S. Packing Co.*, 84 F.2d 444 (9th Cir. 1936).

³¹⁰ 33 U.S.C. § 432(3) (Supp. II, 1965-66).

³¹¹ Pub. L. No. 89-753, 80 Stat. 1246 (1966).

³¹² 33 U.S.C. §§ 431-37 (1964).

³¹³ An amendment to the 1924 act defines person as "an individual, company, partnership, corporation, or association; any owner, operator, master, officer, or employee of a vessel; any officer, agent or employee of the United States." 33 U.S.C. § 433(2) (Supp. II, 1965-66).

³¹⁴ *Id.* § 433(b).

³¹⁵ *Id.* § 434(a).

³¹⁶ *Id.* § 434(b).

³¹⁷ S. 2760 was introduced in the Senate in 1967 and passed by that body in December. It is now before the House. Meanwhile, the President has asked that other pollutants, such as chemical be added to the bills coverage. An Administration bill, called the Oil and Hazardous Substances Pollution Control Act of 1968, (H.R. 15906) has been introduced in the house.

water pollution is considered a public nuisance except in such cases where the Water Pollution Control Board has issued a permit for such pollution.³¹⁸ The mining industry is largely exempted.³¹⁹ Chapter 6111 of the Ohio statute did not create new rights nor provide original remedies to private persons.³²⁰ However, the statute does state that these sections do not abridge rights of action or remedies in equity or under common law.³²¹ A citizen can still sue³²² to protect his riparian rights or suppress nuisances subject to the protection given to polluters by the permit system.³²³

Ohio courts have given riparian owner damages in pollution cases³²⁴ and occasionally injunctions are granted against continuance of pollution.³²⁵ Injury by the intentional deposit of pollutants into a water course which causes injury that might reasonably have been foreseen makes out a cause of action.³²⁶ In these cases involving serious pollution discharges the reasonableness of the defendant's activity was not considered,³²⁷ though in a less serious case it might be.³²⁸ Common law actions for water pollution abatement are not common³²⁹ and perhaps the protection afforded by the permit system is the reason.³³⁰

³¹⁸ OHIO REV. CODE ANN. § 6111.04 (Page 1953).

³¹⁹ *Id.*

³²⁰ Board of Comm'rs v. Mentor Lagoons, Inc., 35 Ohio Op. 2d 244, 216 N.E.2d 643 (C.P. 1965).

³²¹ OHIO REV. CODE ANN. § 6111.08 (Page 1953).

³²² For a discussion of the problems involved in a trial of a water pollution case relating to the pollution of subterranean water by an oil operator, see Allison & Mann, *The Trial of a Water Pollution Case*, 13 BAYLOR L. REV. 199 (1961). This type of problem has arisen in Pennsylvania as polluters seek to end Lake Erie pollution by deep well disposal.

³²³ OHIO REV. CODE ANN. § 6111.01-.08 (Page 1953).

³²⁴ Straight v. Hover, 79 Ohio St. 263, 87 N.E. 174 (1909); City of Mansfield v. Balliett, 65 Ohio St. 451, 63 N.E. 86 (1902); Columbus & Hocking Coal & Iron Co. v. Tucker, 48 Ohio St. 41, 26 N.E. 630 (1891); Ohio Stock Food Co. v. Gintling, 220 Ohio App. 82, 153 N.E. 34 (1926); Standard Hocking Coal Co. v. Koontz, 50 Ohio App. 84 (1915); Upson Coal & Mining Co. v. Williams, 7 Ohio C.C.R. 293 (Cir. Ct. 1905); City of Mansfield v. Hunt, 19 Ohio C.C.R. 488 (Cir. Ct. 1900); Tepe v. Norwood, 1 Ohio L.R. 9, (1903), *aff'd*, 71 Ohio St. 519, 74 N.E. 1134 (1904).

³²⁵ Vian v. Sheffield Bldg. & Dev. Co., 85 Ohio App. 191, 88 N.E.2d 410 (1948); Kirk v. City of Cincinnati, 25 Ohio N.P. (n.s.) 473 (Super. Ct. 1925).

³²⁶ Columbus & Hocking Coal & Iron Co. v. Tucker, 48 Ohio St. 41, 26 N.E. 630 (1891).

³²⁷ *But see* Pennsylvania Coal Co. v. Sanderson, 113 Pa. 126, 6 A. 453 (1886).

³²⁸ Ratcliffe v. Indian Hill Acres, 93 Ohio App. 231 (1952).

³²⁹ C. CALLAHAN, PRINCIPLES OF WATER RIGHTS LAW IN OHIO 13 (1957); 55 OHIO JUR. 2d, § 39 (1963). *See generally* J. SAX, WATER LAW 292 (1965); Note, *Stream Pollution — Recovery of Damages*, 50 IOWA L. REV. 141 (1964).

³³⁰ OHIO REV. CODE ANN. § 6111.04 (Page 1953).

IV. RESULTS OF LEGAL ACTION

To solve the pollution problems of Lake Erie, action has been initiated at the local, state, federal, and international levels of government. The problem itself is one which taxes the ability of a legal system that evolved in a much less complex era. It is a complicated technical problem requiring the application of expertise which often many of the participants have not yet gained.³³¹ It is an economic problem, for the high cost of abatement will have an important effect on the public economy, while the cost of abatement to industry will introduce an important new cost of business operation.³³² It is a social problem, for environmental controls will introduce additional governmental regulation at a time when many people are resisting further governmental restrictions. Further, these controls tend to encourage monopoly and favor large units which can make the necessary capital investments. Yet, a high density population with a complex interdependent economy can not have the laissez-faire government which the bucolic life could provide.

Pollution abatement also raises philosophical questions concerning the proper relationship between the gross national product and the quality of life. Does the time arise when further gain in one area detracts from the other?³³³ If clean water is considered an important factor determining the quality of life, then, suffi-

³³¹ Particularly regarding phosphorus removal, disposal of specialized industrial wastes, and the need for greater efficiency in treatment of sewage where recipient water-courses have problems of low flow.

The FWPCA stated that Lake Erie problems are due to many years of neglect by the citizens and governments of the Basin and lack of knowledge concerning the dynamics of lake ecology.

For it is, in the final analysis, the actions of commission or omission by the people and the governments in the Lake Erie basin as guardians of its water resources, which have placed those resources in their present condition. It is equally true that Lake Erie can be restored to its one-time health and usefulness only if the basin governments, with support from the people, establish the public policies and governmental institutions capable for doing so. At the present time there is inadequate treatment due to insufficient financing, research, surveillance, and enforcement by the basin governments. LAKE ERIE REPORT, *supra* note 5, at 1-2.

³³² Industry includes agricultural wastes which are substantial and can be infectious. One cow produces more waste than 16 people — 6 to 25 pounds of manure for every pound of weight gained, three pounds for every pound of milk. Total agricultural wastes, including manures and food-processing residues, far outweigh the wastes produced by humans and their non-agricultural industries. See Alexander, *Where Will We Put All The Garbage?*, FORTUNE, Oct. 1967, at 148.

³³³ See Brinser, *Standards and Techniques of Evaluating Economic Choices in Environmental Resource Development*, in FUTURE ENVIRONMENTS OF NORTH AMERICA 235 (F. Darling & J. Milton ed. 1966).

cient economic inputs must be made to achieve it.³³⁴ Yet, in an economy governed by finite resources, this qualitative goal must be pursued to the detriment of some other goal. We must make the choice. Do we want an environment undefiled by the wastes of man, and are we willing to pay for it? Will we be willing to make further economic transfer from the private sector of the economy to the public sector?

The pollution problem, thus, becomes in microcosm a test of our legal system's capacity to solve the multifarious and polycentric problems of modern society. As a lawyer, it is interesting to note that even if legal structures are capable of dealing with and controlling such developments, they might be managed without lawyers. Few lawyers are involved in environmental problems. Rather, sanitary engineers, health officials, planners, and other nonlawyers, seem to be those shaping the laws and regulations. The bar seems to have little interest in these social problems and, therefore, by default, it allows leadership to pass to others. It is to these non-lawyers that we must look when seeking to evaluate the results of 3 years of serious pollution abatement activities.

The attempt to cure Lake Erie so far has been a failure. Lake Erie is more polluted today than it was 3 years ago.³³⁵ At the same time, much effort has been expended to reduce pollutants entering the Lake Basin by controlling or eliminating the sources of pollution. As substantial time is required to effectuate planned abatement facilities, activities begun in 1965 are only now going into operation, while the years 1969 to 1972 should bring a substantial number of additional facilities into operation.³³⁶

³³⁴ See Hamilton, *The Process of Making Good Decisions about the Use of the Environment of Man*, 8 NATURAL RESOURCES J. 279 (1968).

³³⁵ According to the data of the Department of the Interior, between periods 1963-64 and 1967-68, conductivity increased 5.6 percent; dissolved solid increased 14 percent, total solids increased 17 percent, chlorides increased 4.2 percent, silica decreased 21.2 percent. U.S. DEP'T INTERIOR, FWPCA, LAKE ERIE SURVEILANCE DATA SUMMARY 1967-68, at 29 (May 1968) (Table 3). This solitary decrease may be due to the absorption of this material by diatoms which have extensively increased and assimilate dissolved silica in skeletal formation. *Id.* at 33. Soluble phosphorus showed no change and data is unavailable for comparative analysis of total phosphorus. However, George Harlow, Director, Cleveland Program Office, FWPCA, says total phosphorus has increased since 1964. Total nitrogen increased 11.9 percent and organic nitrogen increased 41.6 percent.

³³⁶ The OWPCB hopes to meet its low standards for the Lake Erie Basin with new facilities to be completed by 1970, with the exception of one Cleveland sewage plant project which has been scheduled for completion in 1971. OWPCB, ANNUAL REP. (1967).

V. CONCLUSIONS AND RECOMMENDATIONS

Three years of attempted pollution abatement have been concluded, yet Lake Erie is no cleaner. We have responded to the problem with a governmental band-aid when major surgery has been needed. Years of neglect cannot be overcome easily. In 1900 municipal wastes reaching streams had a pollution effect equivalent to the raw, untreated, sewage of a population of about 24 million. At the end of 1959, municipal sewage discharged into our streams, treated and untreated, was equal in pollutorial effect to the untreated sewage from more than 75 million people. If by 1980 secondary treatment by conventional methods is provided for the wastes of all people served by sewers, the pollution load delivered to our watercourses will be the same as at present. Industrial wastes create similar problems. In 1900, pollutants from organic industrial wastes were equivalent to that discharged untreated by 15 million people. Today this pollution discharge has a population equivalent of 150 million persons.³³⁷ We need to spend \$22.2 billion for sewage systems by 1975 just to keep pace with our growing population.³³⁸ Another \$10 billion is needed from industry for industrial waste treatment.³³⁹ To meet this need we must run to stand still. Unfortunately, we are barely crawling.³⁴⁰

³³⁷ Stein, *Problems and Programs In Water Pollution*, 2 NATURAL RESOURCES J. 388 (1962).

³³⁸ See, U.S. DEP'T OF HEALTH, EDUC. AND WELFARE, MODERN SEWAGE TREATMENT PLANTS, HOW MUCH DO THEY COST? (1965).

³³⁹ All figures for pollution abatement costs vary substantially. These are some estimates from M. COHN, SEWERS FOR A GROWING AMERICA (1966). Stein, *supra* note 337, estimates 2.1 billion, only a tenth as much. Secretary of the Interior Udall estimates 14.9 billion is needed to clean up municipal pollution. 33 CONSERVATION NEWS, No. 2, 11-18 (June 1, 1968).

It is also estimated that some \$400 million must be spent to control agricultural runoff with such projects as "underdrains, check dams, channel improvements, and grassing slopes of waterways." LAKE ERIE REPORT, *supra* note 5, at 86. See also notes 38, 40, & 117 *supra*.

³⁴⁰ If the 25 million people in the Lake Erie Basin contributed \$15 a year, about the cost of a pack of cigarettes a week, \$375 million a year would be generated for the clean up.

More research must also be undertaken regarding:

- a. Control of nutrient input to Lake Erie.
- b. Effective means to prevent the formation of oxygen-deficient zones in mid-Lake Erie.
- c. Determination of the exact role of Lake Erie bottom sediments in the overall chemistry of Lake Erie.
- d. Effective means to reduce pollution from rural runoff.
- e. Effective means to restore the Lake Erie fishery.
- f. Determination of the role of pesticides in Lake Erie pollution.

The estimated expenditures and net lending for 1968 by the FWPCA is \$190 million. Of this amount a little over \$6 million will be allocated to Ohio.³⁴¹ "The budget provides for continuing construction of ongoing water resource projects at minimum rates. While no ongoing projects will be curtailed in 1967 or 1968, actions taken in the current fiscal year and the stringent budget recommendations for 1969 will, in many cases, delay completion scheduled."³⁴² A minor expenditure in the Defense Department is that for Civil Defense.³⁴³ This program receives almost half the amount allocated to water pollution abatement.³⁴⁴ In 1961, Ohio's Water Pollution allotment was exceeded by the 10 largest agricultural subsidies given.³⁴⁵ This is but a small example of America's sense of priorities.

What does proper water control cost? Here the German experience can be instructive. The Ruhr District is a highly industrialized area which contains six relatively small river basins.³⁴⁶ Its area of 4200 square miles may be compared to the 873-square-mile Cuyahoga River Basin or the 6586-square-mile Maumee River Basin the water of which flows into Lake Erie near Toledo.³⁴⁷ The Ruhr District Authority has been in existence since 1904,³⁴⁸ but its present budget for capital improvements is over \$26 million.³⁴⁹ Their operating budget exceeds 24 million dollars.³⁵⁰ Why then can the richest nation in the world not make expenditures of comparable amounts? The Ohio River Valley Sanitation Com-

g. Determination of the role of radioactive substances in Lake Erie pollution.

h. Determination of the effects of potential increased thermal pollution in Lake Erie.

i. Eutrophication or aging of lakes. LAKE ERIE REPORT, *supra* note 5, at 16 (emphasis omitted).

³⁴¹ BUDGET OF THE UNITED STATES 108 (Fiscal 1969).

³⁴² *Id.* at 109.

³⁴³ This money is spent for such things as our warning system (*i.e.*, municipal horns), for "activities which are required to develop and maintain an optimum capability to perform essential actions in emergency periods to enhance survival probabilities," financial assistance to states for survival supplies and equipment, and administrative expenses (over \$10 million for personal compensation). *Id.* at Appendix.

³⁴⁴ \$89 million. *Id.* at 81.

³⁴⁵ Moore, *Slaves for Rent*, ATLANTIC, May 1965, at 109, 118.

³⁴⁶ Fair, *Pollution Abatement In The Ruhr District*, in COMPARISONS IN RESOURCE MANAGEMENT 143 (Jarrett ed. 1961).

³⁴⁷ U.S. DEP'T OF INTERIOR, FWPCA, LAKE ERIE ENVIRONMENTAL SUMMARY 1963-1964, at Table 2 (1968).

³⁴⁸ Fair, *supra* note 346, at 168.

³⁴⁹ This figure is for 1959 in United States dollars.

³⁵⁰ Fair, *supra* note 346, at 171.

mission (ORSANCO), which manages an area substantially larger (154,000 square miles)³⁵¹ than the Ruhr District, limps along on an operating budget of under \$239,000.³⁵² With more than 30 times the area of the Ruhr, ORSANCO has a budget which is only 1 percent of the German Commission.³⁵³ Lake Erie does not even have an organization such as ORSANCO working on its myraid of problems.

To determine the cost of cleaning up the Lake is difficult. Figures are but estimates and they vary considerably. The problem is so complex that no one can really know. The time required to carry out programs exposes them to additional costs, resulting from the general inflation particularly evident in construction costs.³⁵⁴ United States Supreme Court Justice William Douglas estimates it would cost \$10 billion to save Lake Erie.³⁵⁵ Mr. Murry Stein³⁵⁶ estimates \$7.69 billion is required.³⁵⁷ The ever-optimistic State of Ohio estimates \$400 million is needed.³⁵⁸ Mr. George Harlow³⁵⁹ believes the costs to each taxpayer for secondary treatment would be only \$8 to \$9 a year if the state would develop a coordinated plan to merge hundreds of small treatment units.³⁶⁰ The net cost of cleaning up Lake Erie would also be reduced if the economic damage presently caused by pollution was terminated. It is estimated that water pollution currently costs the nation \$13 billion a year.³⁶¹

³⁵¹ OHIO RIVER VALLEY WATER SANITATION ANN. REP. (1965), at 2.

³⁵² OHIO RIVER VALLEY WATER SANITATION YEARBOOK (1966), at 42.

³⁵³ These figures are only meant to illustrate the gross disparity between needs and available funds. Accurate comparison would be very difficult as the functions carried out by the Ruhr District include activities which in the United States would be handled by a variety of governmental units as well as industry.

³⁵⁴ For a discussion of when investments in additional water facilities should be made to meet future needs, see J. HIRSHLEIFER, J. DEHAVEN, J. MILLIMAN, WATER SUPPLY ECONOMICS, TECHNOLOGY, AND POLICY 114 (1960) [hereinafter cited as HIRSHLEIFER]. When evaluating these high costs it is useful to note that value added by manufacture in 1965 was nearly \$4 billion in Cleveland and over \$18 billion for Ohio. FEDERAL RESERVE BANK OF CLEVELAND, STATISTICAL PROFILE: STANDARD METROPOLITAN STATISTICAL AREAS OF THE FOURTH FEDERAL RESERVE DISTRICT 19 (1968).

³⁵⁵ Douglas, *The Glory Is In Danger*, HOLIDAY MAGAZINE, May 1968, at 65.

³⁵⁶ Assistant Commissioner for Enforcement, FWPCA.

³⁵⁷ Discussion, *The Politics of Planning*, presented by the League of Women Voters, Lake Erie Basin Committee (Mar. 26, 1968).

³⁵⁸ Cleveland Plain Dealer, June 3, 1968, at 13, col. 3.

³⁵⁹ Director, Cleveland Program Office, FWPCA.

³⁶⁰ Cleveland Plain Dealer, note 358 *supra*. However, this would still cost much more than the Ohio estimate.

³⁶¹ 203 THE NATION 4 (1966).

Net costs and abatement costs, however, are very different. Generally abatement costs must be initially absorbed by industry or the public sector of the economy. The savings are indirect and often difficult to observe, for the benefit usually goes to the private sector of the economy. This is a large part of the problem of raising public funds to prevent additions to the uncompensated social costs of waste disposal being passed on to others. There is usually no Pareto condition in pollution abatement.³⁶² Someone usually benefits, at least in the short term, by dumping his wastes onto someone else.³⁶³ But in today's highly populated world, one man's urinal is another man's drinking fountain. Chicago sends its wastes down the Illinois River which flows to the Mississippi north of St. Louis.³⁶⁴ Chicago avoids drinking its own effluent at the cost of lowering the water level of Lake Michigan for flushing purposes,³⁶⁵ though other Lake communities in turn pass wastes on to Chicago.³⁶⁶ In St. Louis one drinks from every flushed toilet on the Mississippi from there to Minnesota, including Chicago.³⁶⁷ A drought forced Chanute, Kansas to recycle its water through the city from eight to 15 times.³⁶⁸ Santee, California, uses waste water for recreation lakes and eventual reuse.³⁶⁹

There is not enough water for future use without reusing our supply,³⁷⁰ across the nation demand in relation to available supply varies from 5 to 85 percent. In some areas demand exceeds supply

³⁶² Welfare economics provides a criterion, the Pareto condition, for judging public policy measures. A social policy is desirable if it results in either (1) everyone being made better off, or (2) someone being made better off without anyone being made worse off. Davis & Winston, *The Economics of Urban Renewal*, 26 LAW & CONTEMP. PROB. 105 (1961).

³⁶³ Frankel, *Water Quality Management: Engineering-Economic Factors in Municipal Waste Disposal*, 1 WATER RESOURCES RESEARCH 173 (1965).

³⁶⁴ U.S. DEP'T OF INTERIOR, FWPCA, WATER POLLUTION PROBLEMS OF LAKE MICHIGAN AND TRIBUTARIES 48 (1968). See also M. WHITE, WATER SUPPLY ORGANIZATION IN THE CHICAGO REGION 56 (1934).

³⁶⁵ 1 WATER CONTROL NEWS, No. 30 (Dec. 12, 1966).

³⁶⁶ See generally SAVE OUR LAKES (published by Chicago Tribune 1968).

³⁶⁷ M. GORDON, SICK CITIES 110 (1966).

³⁶⁸ Bryan, *Water Supply and Pollution Control Aspects of Urbanization*, 20 LAW & CONTEMP. PROB. 176, 183 (1965).

³⁶⁹ Stevens, *Every Drop Counts*, NATIONAL CIVIC REV. 142 (March 1967).

³⁷⁰ Public water supply is not a significant consumptive use, but is used and returned as waste. In 1900, such use was 3 billion gallons per day. In 1965 it had increased to an estimated 25 billion gallons per day. Total water use went from 40.19 to 359.47 billion gallons per day. A. KNEESE, WATER RESOURCES DEVELOPMENT AND USE 11 (1959). See also Lear, *The Crisis in Water and What Brought It On*, SATURDAY REV., Oct. 23, 1965, at 24.

and underground water is being mined,³⁷¹ a practice which introduces problems of its own.³⁷² In the Lake Erie Basin the quantitative supply is more than adequate, and recycling is a minor problem except that we are dealing with a lake. On a river one can take water upstream from the waste discharge.^{372a} Thus, there is little incentive to control pollution, for one drinks not his own but his upstream neighbor's wastes. On a lake, everyone's straw is in the same septic tank. The qualitative deterioration of the Lake³⁷³ is mute testimony to the interest the Basin citizens have in their water resources. After a period of time the qualitative deterioration of a body of water becomes an effective quantitative limitation, for it can no longer be used. Already most people seem to have forgotten the swimming, fishing, and other recreational activities that but a few years ago could be enjoyed safely along Lake Erie and its tributaries. In 1965 the Northeast states endured a long drought. In New York City water use was strictly controlled. Restaurants were ordered to supply drinking water only on request.³⁷⁴ Yet Manhattan is an island — not a desert. Few people seemed to reflect on the sanity of a society that had insufficient water while millions of gallons of the polluted Hudson flowed past the city toward the sea.

If Lake Erie is to avoid the fate of the Hudson — too polluted to be used for a public water supply — the various forms of pollution discussed in this paper must be so combated as to end their inflicting injury to the Lake.³⁷⁵ The Lake is a living ecosystem,

³⁷¹ Haney, *Recent Water Treatment Developments*, 3 CURRENT MUN. PROBLEMS 67 (1961-62).

³⁷² Mexico City's well-known sinkage is attributed to the effects of deep wells.

^{372a} The FWPCA reported that:

Lake Erie and its headwaters, the Detroit River, now supply 82 percent or 1,190 million gallons per day (mgd) of the population's water needs (municipal water supply). *High municipal usage is projected to continue to increase with Lake Erie supplying an ever-increasing percentage.* The rate of consumption will increase faster than the population growth rate. The per capita consumption will be accompanied by a commensurate increase in waste volume. *The existing interference to water supply by wastes will become ever more critical.* LAKE ERIE REPORT, *supra* note 5, at 27 (emphasis in original).

³⁷³ See Bird, *Our Dying Waters*, SATURDAY EVENING POST, Apr. 23, 1966, at 29.

³⁷⁴ LEAGUE OF WOMEN VOTERS, THE BIG WATER FIGHT 37-42 (Cuyahoga County Interleague Council 1966). It is, of course, recognized in using this example that the salinity of the Hudson River would require public drinking water to be pumped from above Poughkeepsie.

³⁷⁵ The Lake Erie FWPCA recommendations presented at Hearings on Water Quality Criteria for the Rocky, Cuyahoga, Chagrin, and Grand River Basins, on May 22, 1968, are generally consistent with the abatement needs suggested throughout this paper.

and, like all living things, it can take just so much abuse before it dies. With the dissolved oxygen in the Lake already seriously impaired, time is running out.³⁷⁶ There are some technical problems to be solved, but they are minor compared to the problems involved in sending a man to the Moon. Even the more complicated industrial waste problems are rapidly solved when the government applies creative tension.³⁷⁷

Once we recognize the aesthetically objectionable character of pollution and the social and economic disadvantages of destroying Lake Erie, we must determine who will pay the mammoth cost. We have seen that much pollution comes from the discarded wastes of humans and from discharges of industrial-commercial enterprises. In terms of harm to the Lake, the industrial wastes are least injurious. Normally these wastes do not carry harmful bacteria, nor, are they the primary source of phosphate nutrients.³⁷⁸ Nevertheless, industrial pollution is certainly undesirable as it is harmful to the Lake ecosystem and the injection into the tributaries of pollution in the quantity that is presently discharged precludes other possible uses of the tributaries. If industry is to be stopped from continuing such profitable but socially reprehensible activity, compulsion must be used against all polluters. No one jurisdiction can afford to in-

There is little technical disagreement among nonpollutors as to what needs to be done. Even many of the polluters and their lackeys agree but argue that we must go slowly. The only group that sometimes disagrees is the Corps of Engineers and the private engineering firms that work on large construction projects. Some of the tributaries of Lake Erie for example will need streamflow augmentation during low flow periods. Such augmentation runs the danger of being used in lieu of waste treatment improvement especially as the federal government builds the augmentation facilities while local government is generally responsible for sanitary sewage treatment. Thus, the Army Corps of Engineers is often a prime mover behind grandiose engineering plans. See Schultz, *Mike Kirwan's Big Ditch*, READERS DIGEST, June 1967, at 59; Whitman, *Restoring George Washington's River*, NATIONAL WILDLIFE, Aug.-Sept. at 5.

³⁷⁶ As temperature increases dissolved oxygen decreases. In the Western Basin in mid-summer, oxygen may be completely exhausted in bottom waters. Oxygen depletion of significance occurs in nearshore waters only in harbor areas and tributary mouths which are receptacles for large volumes of wastes. The most severe conditions occur in Cleveland Harbor and locally in Erie and Buffalo Harbors. Other serious problems occur at the mouth of the Detroit, Raisin, and Maumee River. Conditions in the rivers are more severe upstream away from lake dilution. LAKE ERIE ENVIRONMENTAL SUMMARY, *supra* note 347, at 96.

³⁷⁷ The detergent change-over to biodegradable ingredients is a good example of what can be done under pressure. See text accompanying note 84 *supra*. Another example is the American Petroleum Institute's claim that oil can be desulfurized so as to avoid being a cause of air pollution. CONSERVATION NEWS, June 15, 1968, at 12 (National Wildlife Federation).

³⁷⁸ One exception to this weighing of relative harms are the highly toxic chemicals injected into the lake. Agriculture is the prime culprit with the government itself often intimately involved in their application. See generally R. CARSON, SILENT SPRING (1962).

crease the cost of doing business without endangering the competitive position of its own industries. In the extreme case, the industry will leave the jurisdiction for the more salubrious southern climes.³⁷⁹ Therefore, the federal government must be given increased authority to enforce nationwide compliance with strict regulation on industrial effluents.³⁸⁰ Present progress has been much too slow. If all businesses had the same standards imposed upon them there would be no disadvantage imposed on those who try to protect the environment. Conversely, strict enforcement would take the profit out of pollution. Only those businesses competing in a foreign market or against imported goods would be affected. Any complaints by American industry over this issue should be scoffed at, for some highly industrialized foreign countries have long had more concern for their waters.³⁸¹ The German situation was adverted to previously.³⁸² People have been living in London, England, for 2000 years, but they still have a beautiful river which is the chief source of water for their city; the Thames remains attractive for boating, picnicking, and fishing, yet its water is used half a dozen times by cities and industries before it reaches London.³⁸³

National standards are necessary or, alternatively, the Secretary of the Interior must have more power to force the states to adopt and enforce minimum standards against all industries.³⁸⁴ This latter approach is less realistic if serious abatement efforts are desired. Most of the effective social legislation applied to corporations has been federal. Minimum-wage laws, child-labor restrictions, and safety requirements have long been considered a natural cost imposed on nearly all businesses. Why then do we insist on having the laws governing the pollution of interstate

³⁷⁹ *Clean Rivers Versus Good Jobs*, THE NATIONAL OBSERVER, Feb. 19, 1968, at 17, col. 3.

³⁸⁰ Even the conservative economist, Milton Friedman, would agree that pollution cannot be controlled by the unregulated market system. Friedman, *The Role of Government in a Free Society*, in CONTROLLING POLLUTION, THE ECONOMICS OF A CLEANER AMERICA 73 (R. Goldman ed. 1967).

³⁸¹ For reports of the Federal Republic of Germany, France, Netherlands, Poland, Sweden, United Kingdom, and Yugoslavia, see J. LITWIN, CONTROL OF RIVER POLLUTION BY INDUSTRY (1965).

³⁸² See text accompanying notes 346-53 *supra*.

³⁸³ Langford, *Some Aspects of the Great Lakes Pollution Problem*, in UNITED ACTION FOR CLEAR WATER, REPORT OF THE CONFERENCE 13 (1965).

³⁸⁴ Under 33 U.S.C. § 466(g) (c) (1964) if the state fails to establish water quality standards the Secretary of the Interior can step in, but this would probably not work and has never been tried. For example, enforcement would be very difficult as the procedures are very cumbersome.

navigable waterways by businesses engaged in interstate commerce set by the states and enforced by poor, and ineffectual state administrative bodies? Or is this question rhetorical? Once we accept the concept that pollution controls are to be relatively fixed business costs, they will be passed forward to the consumer to the extent that any other business cost is shifted.³⁸⁵ Few businesses can or will in the long run absorb significant cost increases, for their profit margins will not allow such action. The individual consumer will pay his aliquot share as he has for all socially imposed costs.

Before industrial pollution can be abated the facilities must be provided. Capital costs are high, sometimes a substantial proportion of total capital investment. Business is reluctant to invest its money for often there is no economic return. Even if valuable by-products can be obtained, the profit is usually less than that which can be obtained by a similar investment in a more productive endeavor. Few businesses can control so effectively prices that the prices can be increased to achieve a return on capital investment similar to the return on the other investments in the business. Many businesses cannot obtain such capital or can obtain it only at prohibitively high interest rates. Therefore, if society desires the benefits of pollution control, some financial assistance must be given.

Some suggested benefits would be to relieve water pollution facilities of state sales, real, and personal property taxes. Also, such facilities should not be used to determine a corporation's value for excise or franchise taxation.³⁸⁶ At the federal level, a corporation should be given the option to treat expenditures for water pollution abatement facilities as a business expense³⁸⁷ so as to get

³⁸⁵ Costs cannot or will not always be shifted. A company facing competition from a different material which is not incurring additional pollution abatement costs may have to absorb some of the increased costs. Elasticity of demand, relative costs of production to selling price and government regulation, may preclude increases. For large companies the economics of scale in pollution control may still give competitive advantage vis-a-vis small producers. Some companies such as regulated utilities could use it in the rate formula. Pricing is not always a function of costs. Some cosmetics are priced at whatever the buyer will pay. Costs are so small they are irrelevant in determining price.

³⁸⁶ In Ohio, air pollution facilities are tax exempt from property taxes under the tax statutes. See OHIO REV. CODE ANN. § 5709.25 (Page 1953). Industrial water pollution control facilities are exempt, under *id.* §§ 6111.31-38, only if a certificate is obtained from the Water Pollution Control Board which then exempts them from all state taxes. Parenthetically, that technique of giving the OWPCB the power to certify is of dubious merit. It seems absurd to take control over this subject away from the authorities charged with maintaining the tax system. Eventually, a body of tax law will be produced by the Water Pollution Board.

³⁸⁷ INT. REV. CODE OF 1954 § 162.

an immediate tax write-off rather than having to depreciate such expenditures over many years.³⁸⁸ This should be done without denying the benefits of the Investment Credit Act.³⁸⁹ In addition, the federal government should make low-interest loans to those companies unable to secure funds from traditional sources. These should be limited to companies presently in existence and presently causing pollution without the means of abating it.

It should be emphasized that the recommended assistance is to prevent the government from profiting from the additional investment necessary for pollution abatement and to assure that the necessary capital is available. It is very important that government assistance not be used to pay the costs of pollution control. Any element of the manufacturing process that is free or very low in cost, whether it is capital, labor, raw material, or energy will be wasted. As long as the costs of pollution can be shifted forward onto society in general and/or paid by the government, little incentive exists to terminate the fouling of our environment. Only by making our manufactured products reflect all costs and minimizing the hidden costs engendered by undesirable negative externalities will we have a chance for successful pollution control.³⁹⁰

In addition to government financial assistance, an effluent tax should be placed on all polluters. The rate of the tax would be a function of both quantity and type of pollutant. This tax has been used successfully in the Ruhr Valley of Germany for some time.³⁹¹ In America it would serve primarily as a penalty cost for those adding oxygen-demanding waste or other deleterious substances to our waters. If such a tax were levied by a state as an excise tax for the use of public waters, it should be constitutional. If such an excise tax were levied by the federal government, but were limited to navigable waterways, it too would be constitutionally sound.³⁹²

³⁸⁸ The effect of *id.* § 167.

³⁸⁹ *Id.* §§ 38, 46.

³⁹⁰ An excellent step in this direction was the creation of the Ohio Water Development Authority on March 7, 1968. This Authority has the power to issue revenue bonds and to construct waste treatment facilities for both municipalities and industries. Rather than having to invest after-tax dollars, industry can pay for pollution controls through user charges which can be treated as any other cost of operation. OWPCB CLEAN WATERS FOR OHIO 2 (Spring 1968).

³⁹¹ Fair, *supra* note 346. See also J. SAX, WATER LAW, PLANNING AND POLICY (1968).

³⁹² Federal power over water courses is almost complete. The liberal definition of navigable waterways under the commerce clause of the constitution gives ample authority. See J. BEUSCHER, WATER RIGHTS 320 (1967); F. TRELEASE, WATER LAW 310 (1967). The commerce clause used without dependency upon navigation may give even broader powers. See also *FPC v. Union Electric Co.*, 380 U.S. 90 (1965).

The second source of pollution, the wastes from humans, must be paid for by the citizens of the country. Here the intransigence of the citizens in approving necessary expenditures has led to a situation where extremely large sums of money must be spent merely to catch up after years of neglect. If phosphates are to be controlled, which is the only way that Lake Erie's deterioration can be arrested, the operating costs of treating waste will double to \$50 per million gallons.³⁹³ If the American people want clean water they must accept the fact that they will have to pay for it. Life for primitive man may have been nasty, brutish, and short, but there were compensations. Food was obtained by hunting or gathering it, transportation was by foot, housing was a convenient cave or some rough shelter made of native materials. In those times, free in the economic sense really meant that no money economy existed. Nothing was really free, for effort had to be expended to obtain any of the necessities of life. Many primitives living in arid areas expended substantial time and effort providing water for their needs. Today modern man often assumes he will use his time to earn money which he will exchange for food, clothing, shelter, transportation, and his other needs and wants. But water he expects to be free or at a nominal cost. Why?

The problem of obtaining pure water is thus an economic problem.³⁹⁴ With present technology we can have all the pure water we want if we will pay the price.³⁹⁵ By using desalinization techniques we can pump the oceans to obtain fresh water, however, the costs are high.³⁹⁶ A new Lake Erie is not going to be created out of converted salt water.³⁹⁷ When we insist on dumping our wastes in the water first, then the price for pure water increases; eventually the cost of purification becomes prohibitive. Then, as in New York, the polluted water flows by the community suffering from drought. The Lake Erie problem shows that man is capable of destroying an entire ecosystem. He can change the face of the earth but, as in this case, not often improve it.

³⁹³ Statement of George Eagle, Conference on Pollution of Lake Erie and Its Tributaries (June 4, 1968). See also *supra* note 99.

³⁹⁴ See A. KNEESE & S. SMITH, *WATER RESEARCH* (1965); Baxter, *Economic Considerations of Water Pollution Control*, J. WATER POLLUTION CONTROL FEDERATION, Oct. 1965, at 1365-69.

³⁹⁵ Hirshliefer, *supra* note 354, at 32-73; A. KNEESE, *supra* note 370.

³⁹⁶ U.S. DEP'T OF INTERIOR, *THE A-B-SEAS OF DESALTING* (1966); U.S. DEP'T OF INTERIOR, *SALINE WATER CONVERSION REPORT* (1966); H. STILL, *THE DIRTY ANIMAL* 124 (1967).

³⁹⁷ U.S. DEP'T OF INTERIOR, *FWPCA, A NEW ERA FOR AMERICA'S WATERS* 8 (1967).

If Americans are to have pure water they must pay the cost and the cost will include payment for redeeming waters defiled by generations of users. Persons who become reconciled to the need of pollution controls often manifest their latent reluctance to spend the money by arguing that the impecunious citizenry needs financial assistance from a higher level of government. This argument has some merit, but it is basically fallacious. Having the federal government provide the money for cleaning up Lake Erie will not bring Mississippi's tax revenues to Ohio. We in the Lake Erie Basin will pay for any federal clean-up. The advantage of federal intervention is that it has jurisdiction over a larger area and thus can deal with the problem more comprehensively. It also has a revenue system that generates the necessary money. Indeed, it may be less costly to collect the money through the income tax and return it to local governments, than for the local governments to collect the money.³⁹⁸ The use of the federal government as a financial source thus has one salient advantage — it has a mechanism for collecting money that is effective. Local citizens still pay the bill, but the government that can raise over \$3 billion in 1968 for a manned lunar landing³⁹⁹ can perhaps be convinced to substantially increase its commitment to water resources.⁴⁰⁰

In 1968 expenditures for our Space Resource and Technology program⁴⁰¹ were roughly double the expenditure for all land and water resource programs.⁴⁰² This includes all the money spent not only for water pollution control and research but federal power activities, reclamation, TVA, saline water research, the Bureau of Land Management, the Bureau of Indian Affairs, and the Corps of Engineers. Has the time not come to bring our space program down to earth? Is the only way to get money spent on domestic

³⁹⁸ The cost of collecting the federal income tax in recent years has been less than ½ of one percent. U.S. TREAS. DEP'T INCOME TAXES 1862-1962 37 (Internal Revenue Service Publication No. 447, 1963). No other tax has ever been collected as efficiently. City income taxes can be efficiently collected only through withholding provisions. Administrative costs can reach 8 percent for individuals who pay taxes on income not subject to withholding. L. ELISON, *THE FINANCES OF METROPOLITAN AREAS* 91 (1964). See also Cook, *Effects, Problems and Solutions of Central Collection of Municipal Income Taxes*, 19 CASE W. RES. L. REV. 900 (1968). Costs of returning the money to the states are more difficult to ascertain as program supervision is generally involved and these costs vary depending upon the degree of federal involvement in the substantive aspects of the program.

³⁹⁹ BUDGET OF THE UNITED STATES 99 (Fiscal 1969).

⁴⁰⁰ See U.S. DEP'T OF INTERIOR, FWPCA, FEDERAL GRANTS AND OTHER FINANCIAL ASSISTANCE FOR CLEAN WATER (1968).

⁴⁰¹ BUDGET, *supra* note 398, at 99.

⁴⁰² *Id.* at 108.

problems one which convinces the American people that a spin-off of pollution technology will enable the killing of a billion people at the push of a button? It seems ironic that the government body that has been involved in water resource development since 1789 and has failed dismally for nearly two centuries in preventing or abating pollution and still has nominal interest in the problem should, nevertheless, be the group best qualified to solve our monumental environmental problems.

When one looks at the states' contribution to water pollution abatement it is easier to understand why the federal government has to become more actively involved. The Ohio State Government has demonstrated that it is possible to approach the point of doing nothing to solve the problem while creating an atmosphere of action. The Ohio Water Pollution Control Board was created by the Ohio Water Pollution Control Act of 1951, originally known as the Deddens Act.⁴⁰³ Ohio's Department of Health, however, has been involved since 1893 in public water supply and sewage improvements.⁴⁰⁴ The Board set out to convince the public that progress was more than satisfactory. Reports in 1959 emphasized the doubling of capacity of municipal sewage facilities between 1952 and 1959.⁴⁰⁵ No mention was made of the population increase, the increased water use per capita, or the increased urbanization that largely nullified these gains.⁴⁰⁶

An article in 1966 by the chairman of the Water Pollution Control Board entitled *Let's Get The Record Straight*⁴⁰⁷ told of Ohio's alleged leadership in water pollution control primarily by castigating the other states (which they deserved), but leaving the impression that in 1966 Ohio's progress was exemplary. Another publication of the Board, *Billion Dollar Program Outlined*, extolled

⁴⁰³ OHIO REV. CODE ANN. §§ 6111.01-.08 (Page 1953).

⁴⁰⁴ *Id.* § 3710.18. In 1908 the Bense Act, amended in 1919, 1921, 1935, & 1945, *Id.* §§ 6111.09-30, became Ohio's pollution control law. In 1925 the legislature amended and clarified Ohio Department of Health authority in sections 3701.18-.21. LEAGUE OF WOMEN VOTERS OF OHIO, WATER POLLUTION CONTROL, POLLUTION CONTROL BOARD POLICIES, PROGRAMS, AND LAWS IN OHIO 6 (1966).

⁴⁰⁵ Adams, *Water Pollution Control In the Great Lakes Region*, 37 U. DET. L.J. 96, 113 (1959).

⁴⁰⁶ See generally Mathews, *Municipal Water Problems — Some Legal Aspects*, in 1 CURRENT MUNICIPAL PROBLEM 8 (1959-60); Hines, *Nor Any Drop to Drink: Public Regulation of Water Quality, Part I: State Pollution Control Programs*, 52 IOWA L. REV. 186 (1967).

⁴⁰⁷ OHIO DEP'T OF HEALTH, DIVISION OF ENGINEERING, REPORT AND RECOMMENDATIONS ON WATER QUALITY FOR THE CUYAHOGA, CHAGRIN, AND GRAND RIVER BASINS AND THEIR TRIBUTARIES 2 (May 1968).

Ohio's progress without mentioning that Ohio was not putting up the money.⁴⁰⁸ Indeed, Ohio spends virtually nothing for pollution abatement. Cleveland's former Mayor Ralph Locher regularly protested that the city had never received a nickel from the State of Ohio for pollution control nor had any of the other major cities in Ohio.⁴⁰⁹ Cuyahoga County, which includes Cleveland, for 1967 estimates over \$1 million of expenditure by the sanitary engineer, but none of this represents state or federal funds.⁴¹⁰ State assistance is limited to administrative aid and technical information with some very limited assistance regarding loans and the purchase of bonds.⁴¹¹ But Ohio has no shame. Rather than admit their abrogation of government responsibilities, the Ohio Water Pollution Board generates public relations releases for the do-nothing state. *Construction at High Pace* is typical of the state's articles congratulating itself for its pollution abatement program.⁴¹²

The Board suffers when compared to ORSANCO⁴¹³ which has primary responsibility for water pollution control in southern Ohio where water drains into the Ohio River. Since 1948 impressive strides have been made in the Ohio River Basin⁴¹⁴ while the Lake Erie Basin, the primary responsibility of the Water Pollution Control Board, deteriorated. Up to this date the main contribution of the Board has been to make studies, cajole municipalities into spending their own money for municipal facilities, and setting very low water criteria goals. Recently they were given the power to freeze construction in areas with inadequate sewerage systems.⁴¹⁵ Time will tell if this power will be exercised. A quotation from an article by a staff member of the Ohio Department of Health, Division of Engineering, Water Supply, is revealing:

What is the general condition of our 5,000 streams and rivers in Ohio? The answer may be in a recent article published in the magazine, *Saturday Evening Post* stating, "It is a dismal fact that

⁴⁰⁸ OWPCB CLEAN WATERS FOR OHIO 2 (Fall 1966).

⁴⁰⁹ Statement by Ralph S. Locher, Mayor of Cleveland, at the Ohio Water Pollution Control Hearing (Nov. 30, 1966).

⁴¹⁰ COUNTY OF CUYAHOGA, STATE OF OHIO ANNUAL BUDGET at Chart IV (1967).

⁴¹¹ NATIONAL ASSOCIATION OF COUNTIES RESEARCH FOUNDATION, COMMUNITY ACTION PROGRAM FOR WATER POLLUTION CONTROL 114 (1967). See also OHIO REV. CODE ANN. §§ 133.01-99 (Page 1952).

⁴¹² OWPCB CLEAN WATERS FOR OHIO 2 (Fall 1967).

⁴¹³ OHIO REV. CODE ANN. § 6113 (Page 1954).

⁴¹⁴ LEAGUE OF WOMEN VOTERS, INTER-LEAGUE SURVEY COMMITTEE FOR THE OHIO RIVER BASIN, THE OHIO RIVER BASIN 30-31 (1964).

⁴¹⁵ CLEAN WATERS, *supra* note 412.

we now have seriously contaminated and despoiled almost every creek, river, lake, and bay in the United States."

The Division of Engineering under the Department of Health and the Division of Water in the Department of Natural Resources is presently observing our streams.

Twenty-two automated monitoring stations, located on major rivers and streams in Ohio, continuously record water quality information 24 hours daily.⁴¹⁶

It is not intended here to castigate either a serious scientist or a important monitoring program. But when is this information to be used to achieve results? For a condemned man to know the diameter and tensile strength of the rope and the name of the hangman removes neither the hangman nor the rope. Additional scientific study of rope elongation under stress would have questionable utility, but in water pollution, this is what is done. The lower Cuyahoga River often has no oxygen and its bacterial count is astronomical. The pollution pours into the river and the data pours out of commissions.

The Ohio Water Pollution Control Board takes the brunt of any criticism of the failure of Ohio to clean up its waters, but it is a small administrative agency, overworked, understaffed, underfinanced, and with very little power. They do not make policy but carry out the policy of the state's elected officials. They do excellent technical work. The Health Department's engineering staff produces excellent studies. Without political backing and operational funds, there is little they can do. With Ohio's government not providing money for abatement, they become almost irrelevant as a meaningful force for pollution abatement. Ohio is constantly being urged to bring their staff to sufficient strength and to provide them with sufficient budget to do the job but the urging is to no avail. The FWPCA, Lake Erie Program Office, recommends that the state control program should have a staff of 200 people and a budget of \$2 million a year.⁴¹⁷ Reality is quite different. The engineering staff had in 1965 the equivalent of nine professional men. The entire engineering staff was but 22 people. Hiring was hampered by the fact that Ohio's salary scale for engineers was below that of neighboring states. The budget is equally small. In 1964-65 the state spent \$239,808 and a federal grant-in-aid was

⁴¹⁶ Neal, *Reclaiming Our Polluted Waters*, OHIO'S HEALTH, Jan. 1968, at 9.

⁴¹⁷ Statement of George Harlow, *Hearings on Water Quality Criteria for the Rocky, Cuyahoga, Chagrin, and Grand River Basins and Their Tributaries, Before OWPCB* (May 22, 1968).

allotted to Ohio of \$214,900.⁴¹⁸ Not only is Ohio's contribution too low for meaningful results to be achieved,⁴¹⁹ but there seems to be a tendency for any increase in federal aid to be matched by a decrease in the state contribution.⁴²⁰

Ohio has been discussed because of the writer's familiarity with the state. What has been said about Ohio applies to the other states. From the Detroit River into Lake Erie comes 82.307 percent of the total Lake supply of water.⁴²¹ Canada also adds water to the Lake. If Lake Erie is to be cleaned up, it cannot be done by Ohio alone. But Ohio will not be able to use moral or legal pressure successfully against the other polluting states while her tributaries entering the Lake are vile and polluted.

Municipal governments are the largest source of lake pollution. Not surprisingly, municipal governments have not been in the forefront of pollution abatement activities.⁴²² Their problem is the inability to generate money. The real property tax is the bulwark of local government and it has very limited potential for raising additional revenues.⁴²³ Increasing per-capita costs, loss of land to urban renewal⁴²⁴ and federal highways,⁴²⁵ and expansion of tax exemptions,⁴²⁶ to name only a few, all limit the cities ability to raise funds. In Ohio, the state preempted the sales tax with the pro-

⁴¹⁸ See LEAGUE OF WOMEN VOTERS, *supra* note 404, at 16.

The lack of meaningful state regulatory programs has led the FWPCA to state: The high stakes at issue in Lake Erie, the requirements of the water quality standards program, and the growing Federal and State monetary investment in local waste treatment facilities (and in private facilities, through tax write-offs and other financial inducements) all combine to underscore the urgent need for increased enforcement, operator training, technical assistance, research, direction, closer supervision of the performance of waste treatment at the local level, and better planning for overall water quality management. This will come only if the States greatly strengthen their own will and ability to carry out these functions.

To do so, the staff and monetary resources of the State water pollution control agency in each State must be greatly expanded. Ohio particularly must strengthen the support given its water pollution control agency. LAKE ERIE REPORT, *supra* note 5, at 82.

⁴¹⁹ Jacobi, Pavia & Ricketts, *Staffing and Budgetary Guidelines for State Water Pollution Control Agencies*, 37 J. WATER POLLUTION CONTROL FEDERATION, Jan. 1965, at 8, is also consistent with a staff of 209 and budget of \$1,960,000 for recommended proper functioning.

⁴²⁰ LEAGUE OF WOMEN VOTERS, *supra* note 404.

⁴²¹ LAKE ERIE ENVIRONMENT SUMMARY, *supra* note 347, at Table 3.

⁴²² See, e.g., Statement by Ben S. Stefanski, *Hearings*, *supra* note 417.

⁴²³ See H. GROVES, *FINANCING GOVERNMENT* 47 (6th ed. 1964).

⁴²⁴ See generally S. GREER, *URBAN RENEWAL AND AMERICAN CITIES* (1966).

⁴²⁵ M. GORDON, *SICK CITIES* 27 (1966).

⁴²⁶ Reitze, *Real Property Tax Exemptions In Ohio — Fiscal Absurdity*, 18 WES. RES. L. REV. 64 (1966).

vision to return \$24 million a year to local governments.⁴²⁷ This sum was more meaningful to local governments in 1934 when the fund was first established. Now it is completely inadequate. Today the lack of state funds not only hampers the municipal governments directly but prevents them from obtaining federal funds under the matching fund requirements of the Federal Water Pollution Control Act.⁴²⁸ Only the income tax remains and a city's financial needs in other areas are so overwhelming that additional monies for pollution control are difficult to obtain.

Before a local government gives up and runs for federal aid, it should reflect on the problem. It is certainly a local problem. In this day of expanded federal jurisdiction it is difficult to visualize a problem more local in nature than the disposal of the personal wastes of a community's citizens. If the desire to control this problem is present, the financial resources are available.⁴²⁹ Federal money comes from the local community too. It is not the lack of money but an intractable archaic fiscal system that makes raising funds on a local level very difficult. In the case of water and sewage treatment the remedy is simple and available. Most cities charge nominal rates for these services and bill quarterly or even less often. There is a great opportunity to raise additional revenues for pollution abatement merely by converting to a monthly billing system and administering water and sewage services in the same manner as gas and electric charges currently are handled.⁴³⁰ There is no reason for not treating such services as merely another utility and charging accordingly. In 1890, 1878 public water systems served 23 million persons and a third of these were investor owned profit-making businesses.⁴³¹ If charges were increased then revenue

⁴²⁷ OHIO REV. CODE ANN. § 5739.21 (Page Supp. 1967).

⁴²⁸ 33 U.S.C. § 466(e) (1958).

⁴²⁹ See Shaw, *Sewage and Water Problems as They Affect Metropolitan Financing*, TAX INSTITUTE, FINANCING METROPOLITAN GOVERNMENT 94 (1955).

⁴³⁰ Roderick, *Rate Structures for Industry*, 34 J. WATER POLLUTION CONTROL FEDERATION 311 (Apr. 1962).

⁴³¹ AMERICAN WATER WORKS CO., INC. ANN. REP. FOR 1967. See also Moses, *Irrigation Corporations*, 32 ROCKY MT. L. REV. 527 (1960).

Three Great Lakes states — Illinois, Michigan and Ohio — on November 5 will present their voters with bond issues which include funds for water resource projects, particularly pollution control and recreation.

Illinois' Natural Resources Development Bond Act which would permit the issuance of up to \$1 billion in bonds for the conservation and development of natural resources was enacted by the General Assembly in July. Proceeds of the bond issue would be used to combat water and air pollution for outdoor recreational facilities, for conservation and management of water resources, and for flood control. The Act is a revision of a measure passed

bonds could be used to raise money for capital construction and retired with the proceeds of the water utility. This plan is so simple that one wonders what is the flaw. The flaw is that it takes the will of the voters to cast a vote of dollars for clean waters.

Lake Erie's pollution is a serious problem but it is subject to control if the citizens are willing to meet the costs. At present, sewage treatment is about the cheapest service a municipality provides its citizens. A community of 50,000 may invest \$102 per capita in its hospitals and \$303 in its schools, but it needs to invest only \$36 per capita for secondary sewage treatment. For a city of one million, the costs decrease to about \$12.⁴³²

Industry, particularly large industry, may move to abate its pollution. "It will do what is in its power to assure the fitness of its products in relation to man's environmental health. It will also seek to carry out its production operation to . . . conserve environmental resources by controlling and limiting industrial wastes."⁴³³ But industry will only move when citizen pressure forces it to move. The citizenry will only get meaningful industrial cooperation when

earlier which earmarked specific amounts for the several programs. Now, the priorities and funding for projects will be acted on by the Legislature. Removed from the earlier legislation was a provision that funds could be used for loan guarantees to industrial firms desiring to purchase anti-pollution equipment.

In Michigan, two bonding proposals approved by the Legislature this summer are aimed at providing \$335 million for water pollution control and \$100 million for recreation. The "Clean Water" program would utilize \$285 million to pay the state's share of the cost of sewage treatment plants construction and pre-finance about half the federal government's share. The remaining \$50 million would provide a sewer construction loan fund from which financially hard-pressed communities could borrow money for projects. For recreation, a 10-year program is proposed with \$70 million being used for state parks, fishing areas and hatcheries, forest campgrounds, etc. and \$30 million would go to local governments to aid in the development of parks, playgrounds, recreation centers, etc.

The Ohio bond issue proposal totaling \$759 million includes \$120 million for water pollution control and water management projects and \$20 million for parks and recreational area improvements. Relating to the funds proposed for pollution control, last spring the General Assembly created the Ohio Water Development Authority. This body is empowered to construct and operate pollution control facilities and other water development projects financed by revenue bonds to be paid off from rentals and other charges. Funds included in the upcoming referendum would be used primarily for the state's share in pollution control projects which involve federal participation. 12 GREAT LAKES NEWSLETTER, NO. 6, at 2 (July-Aug. 1968).

⁴³² FWPCA, FOCUS ON CLEAN WATER 7 (1966).

⁴³³ Address by Ray L. Schuyler, Assistant General Manager, E.I. duPont de Nemours & Co., Pollution Control — A Challenge for the Nation, at Southern Regional Section American Institute of Chemical Engineers (1964).

they are willing to pay the costs of their own clean-up. They will never get industrial leadership.

President Johnson has stated that "A Great Society is a society more concerned with the quality of its goals than the quantity of its goods."⁴³⁴

[However,] the test of a society's beliefs in a set of values is not its performance in the hour of convenience, in the hour of comfort, but rather its capacity to stand up for its values when it hurts, when it's difficult, and when you are challenged by inertia, by indifference, and by those forces who always have a vested interest in the status quo.⁴³⁵

Will America respond to the challenge? Can Americans spend large sums of money over a long period for their own betterment? History is not reassuring. The ability to adopt to a lower quality environment is a human trait with ominous implications.⁴³⁶ The coal industry was allowed to virtually destroy Appalachia. However, this lesson was not heeded and individuals are still allowed to destroy our land.⁴³⁷ Our public lands were given away.⁴³⁸ The great forests of America were leveled.⁴³⁹ True forests with trees more than a foot in diameter can be found today only in a few locations east of the Mississippi and these are small stands. The last virgin forests in the West are being gobbled up to supply cheap lumber for Japanese mills.⁴⁴⁰ The Great Plains area was abused until it became the dust bowl of the 1930's.⁴⁴¹ The high plains today are still overgrazed and little concern exists for the continuing diminution in quality of our soil.⁴⁴² It took years of bicker-

⁴³⁴ Address by President Johnson, University of Michigan Commencement, May 23, 1964.

⁴³⁵ Address by Walter Reuther, President of the United Auto Workers at the United Action for Clear Water Conference, Nov. 6, 1965.

⁴³⁶ [T]he worst pathological effects of environmental pollutants will *not* be detected at the time of exposure; indeed they may not become evident *until several decades later*. In other words, society will become adjusted to levels of pollution sufficiently low not to have an immediate nuisance value, but this apparent adaptation will eventually cause much pathological damage in the adult population and create large medical and social burdens. Dubos, *Adapting to Pollution*, SCIENTIST AND CITIZEN, Jan.-Feb. 1967, at 1, 3.

⁴³⁷ See H. CAUDILL, NIGHT COMES TO THE CUMBERLANDS (1962); LIFE, Jan. 12, 1968, at 54.

⁴³⁸ See, e.g., B. HIBBARD, PUBLIC LAND POLICIES (1924).

⁴³⁹ M. FROME, WHOSE WOODS THERE ARE (1962).

⁴⁴⁰ See Wall Street Journal, Mar. 25, 1968, at 20, col. 7. *Id.* June 3, 1968, at 18, col. 1.

⁴⁴¹ D. COYLE, CONSERVATION 120 (1957); R. KERR, LAND WOOD AND WATER 66 (1966); E. MORGAN, GOVERNING SOIL CONSERVATION 1 (1965).

⁴⁴² See P. FOSS, POLITICS AND GRASS (1960); Rockie, *Soil Conservation*, in CONSERVATION OF NATURAL RESOURCES (G. Smith ed. 1968).

ing to get a Red Wood Park — and then, at the cost of other federal land which is to be traded. Washington seemed to think we could not afford the cost, yet, only three or four days of the cost of the Vietnam War is involved for the most costly proposals.⁴⁴³ Even the air we breathe can no longer be considered wholesome.⁴⁴⁴

America has not used its resources wisely.⁴⁴⁵ Will our poor husbandry continue until man travels the route of the sea mink, the Labrador duck, the passenger pigeon, and the key deer?⁴⁴⁶ Probably not, for man usually has the ability to make those modifications necessary to permit survival. Sufficient financial inputs will be made to assure the survival of our species,⁴⁴⁷ but it is equally prob-

⁴⁴³ On October 2, 1968, the President signed S. 2515 into law, establishing the Redwood National Park. National Wildlife Federation, Conservation Rep. No. 36, at 301 (Oct. 4, 1968). The total cost is estimated at \$92 million, but the Northern Redwood Purchase Unit of the National Forest System is available to the Secretary for exchange purposes. *Outdoor America*, Oct. 1968, at 1. Redwood Park Proposals have been covered almost continuously in the *Sierra Club Bulletins* for several years. See, e.g., McCloskey, *Progress On Redwoods*, SIERRA CLUB BULL., Sept.-Oct. 1966, at 20; McCloskey, *Why Worry About the Redwoods?* SIERRA CLUB BULL., Oct. 1967, at 46; Wayburn, *Club Proposes Additions to Redwood National Park as Voted by the Senate*, SIERRA CLUB BULL., March 1968, at 14.

⁴⁴⁴ See D. CARR, *BREATH OF LIFE* (1965); H. LEWIS, *WITH EVERY BREATH YOU TAKE* (1965).

⁴⁴⁵ See generally S. UDALL, *THE QUIET CRISIS* (1963). For a discussion of one state whose beauty is presently being destroyed, see W. DOUGLAS, *FAREWELL TO TEXAS A VANISHING WILDERNESS* (1967).

⁴⁴⁶ For a discussion of the many species of wildlife that have succumbed to man's environmental attack, see Shoman, *Wildlife*, in *AMERICA'S NATIONAL RESOURCES* 111 (Callison ed. 1967); SWAIN, *FEDERAL CONSERVATION POLICY 1921-33*, at 30, (1965). See also U.S. DEP'T OF INTERIOR, *BUREAU OF SPORT FISHERIES AND WILDLIFE, SURVIVAL OR SURRENDER FOR ENDANGERED WILDLIFE* (1965).

⁴⁴⁷ At least survival in the short term. Many of the fundamental ecological changes which man in his ignorance is making may challenge continued existence as a species.

In recent years nearly every literate person has become cognizant of the "quality" deterioration of our environment. However, this knowledge has not been translated into the meaningful societal actions necessary to halt the fouling of our habitat. This destruction of our environment was at one time an aesthetic problem. Today it involves the survival of mankind as a species. Man has been on earth for a very short period. His technological changes involve only a little more than a century so that his myopic view should not obscure the insignificance of their span of time. Assuming he survives his radiological, biological, and chemical war toys, he still must face the long term effects of pesticides, air pollution, destruction of the soil, etc. Man should not be sanguine. Address by Arnold W. Reitze, Jr., at the Research Conference on Nucleation, Precipitation and Solidification, sponsored by the U.S. Dep't of Interior, Sept. 23, 1968, held at Cleveland, Ohio.

It is uncertain that Lake Erie can feasibly be returned to its pre-existing state of aging, that condition which existed prior to man's appearance, or even to the condition which existed at the turn of the century. It can be reliably predicted that the lake will return to some intermediate state of aging, but the exact state cannot be predicted. Probably more important is that the rate of aging, now accelerating rapidly, can be brought back to near the natural rate. Most important is that these changes will result in a major im-

able that the qualitative aspects of our environment will continue to decline. Wild fowl hunting, fishing, and swimming will be water activities that slowly disappear. Even today few people seem concerned, yet many can still remember when these activities were local past times for those living in the cities around the Lake. The population and gross national product may continue to rise, but maintenance of present environment quality will be difficult and expensive.⁴⁴⁸ We must work hard in order not to lose ground. Significant improvement can be made only if there is a national will to make our environment pleasant regardless of cost. We can afford it, but will we?

provement in water quality and the sustaining of that quality. LAKE ERIE REPORT, *supra* note 5, at 9.

⁴⁴⁸ For an interesting discussion of qualitative environmental considerations involved in growth, see Lampert, *Let's Outgrow the Growth Mania*, NATIONAL PARKS MAGAZINE, Apr. 1965, at 4. See generally Bush, *Burdened Acres — The People Question*, LIVING WILDERNESS, Spring & Summer 1967, at 28; Lyon, *An Ecologist's View of the Population Problem*, *id.* at 31. See also PERSPECTIVES ON CONSERVATION (H. Jarrett ed. 1958); U.S. DEP'T OF HEALTH, EDUCATION, AND WELFARE, A STRATEGY FOR A LIVABLE ENVIRONMENT (June 1967) (Report to the Secretary of HEW by the Task Force on Environmental Health and Related Problems).