10-1-1971

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Environmental Law—Preservation of the Estuarine Zone

What do people want? They can’t save the whole shore. The salt meadows don’t do any good. Neither me nor anybody else wants to live there. It’s nothing but mud and mosquitoes. The only real use for it is marinas and that’s the highest value land use. That makes sense. More and more people are buying boats, and they have to have a place to put them. How many people do you see on the marsh now? A few bird watchers maybe. If they want to bird watch on it, I don’t care. I’ve got better things to do than that, but I don’t tell them what to do. Why are they trying to tell me? Which do you prefer, birds or people?

The starting point for any discussion of the problems of the estuarine environment inevitably must be man’s attitude toward the estuaries and his understanding of their importance. The quotation above illustrates the prevailing attitude toward the estuarine zone. Our populace considers the estuary lands valuable only if they confer material benefits, but in their natural state marsh and swampland confer only aesthetic beauty and space for limited recreational pursuits. The feeling is that since these values do not outweigh the benefits to be gained by development, the highest and best uses can be achieved only by dredging channels, filling in the marshes, and constructing houses, industrial facilities, or marinas. Thus the prevailing attitude ignores the immense ecological value of the estuarine environment and the benefits conferred indirectly upon society by its continued existence. It is man’s failure to appreciate these benefits that poses the fundamental problem for this discussion.

The legal definition of “estuary” is “that part of the mouth or lower course of a river flowing into the sea which is subject to tide.” However, a more satisfactory definition is “a semi-enclosed coastal body of water having a free connection with the open sea and within which the sea water is measurably diluted with fresh water deriving from land drainage.”

One cannot talk of the estuary alone but must instead refer to the estuarine zone, which is an environmental system

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influenced or affected by estuarine water, salt meadows and marshes, bays, lagoons, sounds, intertidal areas, and areas of mixing between water of the estuary and sea water of the ocean.4

The tide-washed lands of the estuarine zone are the most fertile in nature. "Acre for acre, salt marshes are equal in total production to the highest value croplands, even when the latter is aided by all the science and art of man. . . . The Niantic River estuary, for example, provides about 300 pounds of scallops per acre per year, which is more than the beef yield on good grazing land."5 One noted scholar, Eugene Odum, concluded from research conducted in Georgia that estuarine marshes produce almost ten tons of organic dry materials per acre per year. Such productivity is almost twice that of the best farmland, seven times that of the ocean along the continental shelf, and twenty times that of the ocean beyond.6

However, food production is but a small part of the entire ecological function of the estuaries. They also provide an integral link in the marine life cycle. Phosphates, nitrates, and other minerals wash into the estuarine waters from the land. The remains of marsh plants are converted into organic food by bacteria. Tidal action flushes this mixture from the marsh into the shallow waters where bait fishes, worms, crustacea, shellfish, immature gamefish, and immature foodfish feed on it.7 This continuing process is intimately related to the prosperity of our commercial and sport fishing industries.

Another important function of the estuarine zone is protection of young ocean fish that are too immature to survive in the open sea. Larger predatory fishes are not found in the estuaries, primarily because of the shallow depths and low salinity. Thus, immature fish can utilize the shallows and weed beds as shelters during growth.8

The marshlands of the estuarine zone also are used extensively by migratory waterfowl for wintering, feeding, and breeding. The habitat provides both nutrients and protection, without which these birds could not exist. The disappearance of waterfowl would result in a decrease in

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4Id.
5Hitchcock, supra note 1, at 78.
8Id.
revenues from hunting equipment sales and motel and restaurant accommodations.

Other benefits conferred upon society by the estuarine environment include flood control,\(^9\) silt filtration,\(^{10}\) recreational areas,\(^{11}\) and aesthetic beauty.

The primary problem, therefore, is one of educating the public about the importance of the estuarine zone to the fulfillment of the more direct needs of man. Every effort must be made to explain the necessity of leaving the estuarine environment untouched. If this can be made a matter of common understanding, the direct threats to the estuarine environment will be reduced substantially.

Both natural and man-influenced degradations threaten the estuarine environment. Natural degradations of the estuarine zone constantly occur through the action of wind, tide, hurricanes, and other natural phenomena. Presently most natural forces which cause degradations are beyond our control, although technical advances may someday enable us to dissipate hurricanes and storms producing gale force winds. These forces are also a part of the natural systems of the estuarine zone and assist in the processes of silt filtration, food production, and land creation.

Due to our inability to control natural degradations, our major effort must be directed at those degradations created by man in his never-ending search for "progress." The two general categories of man-influenced degradations are pollution and physical disruption.

\(^9\)MARYLAND STATE PLANNING DEP'T, WETLANDS IN MARYLAND XIII-1 (1970). One acre of marshland is capable of absorbing and holding 300,000 gallons of water.

\(^{10}\)Hawkes, in a reprint from Transactions of the 31st North American Wildlife and Natural Resources Conference, in ESTUARINE RESOURCES 20 (T. Jackson ed. 1969), says:

Removal of the marsh to increase the size of these small refuges [natural harbors] also removes this scouring action and results in heavy siltation throughout the old natural harbor and the new harbor created in place of the marsh. The result is a continuous dredging problem in a much less valuable harbor in an area made far less productive of things which made the entire coast attractive in the first place.

\(^{11}\)Id. at 19. Hawkes states:

Recreational value of the salt marsh itself is high when considered as a hunting, fishing, shellfishing and birdwatching complex. The greatest contribution of the marsh to these activities is, however, well beyond its immediate borders in the form of nutrients which increase productivity and participant success in all of these pastimes throughout whole regions. It is quite probable that the recreational values of both the fin and shell fisheries in shallow coastal waters now equal or exceed their commercial value in the same areas.

The combined value of the two together makes a significant case of itself for reservation of salt marshes.
The effects of the many types of pollutants have been heavily documented in newspaper and magazine reports of environmental catastrophes. The sources of these pollutants include municipal and industrial wastes, pesticide and herbicide run-off from farmland, thermal pollution from electrical utility generating plants, ship collisions, and oil well leakage.

Oil pollution is a growing threat to the coastal areas, especially since the size of vessels used to transport this important commodity is constantly increasing. Commenting upon the effects of oil pollution, Max Blumer, of the Woods Hole Oceanographic Institute, said:

The immediate, short term effects of oil pollution are obvious and well understood in kind, if not in extent. The oil pollution damage to coast lines and to bird populations is well known. . . . Oil pollution on the high seas is just being recognized, even though the amount of tar already exceeds the amount of plant life floating at the sea's surface. In contrast, we are rather ignorant about the long term and low level effects of crude pollution. I fear that these may well be far more serious and longer lasting than the more obvious short term effects.\textsuperscript{12}

In addition, Blumer noted that some of the principal causes of oil pollution in harbor and coastal areas are faults in the design of ships and storage units, mechanical failures, losses in transfers, accidents in shipping, ballasting of bilges, the return to water of petroleum products in untreated municipal wastes, and the incomplete combustion of marine fuels.\textsuperscript{13}

Virtually all of these causes of pollution could be corrected to some extent through modernization of equipment and technological advances in design. And yet, as long as petroleum and oil are necessary for our modern convenience, some pollution will continue to threaten our estuarine zone. Legislation of the type recently enacted by Maine\textsuperscript{14} and Washington\textsuperscript{15} imposing strict liability for damage caused by oil

\textsuperscript{12}Blumer, \textit{Oil Pollution of the Ocean}, \textit{OCEANUS}, October, 1969, at 5.
\textsuperscript{13}Id.
\textsuperscript{14}Ch. 572, sub-ch. II-A, [1970] Me. Spec. Sess. 35, amending Me. Rev. Stat. Ann. tit. 38, ch. 3 (1964). This legislation provides for absolute liability for oil pollution damage caused by the transportation of oil and petroleum products. It creates the Maine Coastal Protection Fund, financed by a tax of one-half cent per barrel of oil transported into the ports of the state, in order to provide immediate financial resources for the rapid cleanup of oil spills.
\textsuperscript{15}Ch. 88, [1970] Wash. Sess. L. 707. This legislation also imposes absolute liability for oil-discharge damage on persons having control over the oil and gives the state the power to approve or disapprove any proposed methods for dealing with oil-discharge catastrophes, thus avoiding the
discharge appears to be a needed step toward countering the deleterious effects of oil contamination.

Municipal and industrial waste disposal poses another threat to our estuaries by causing eutrophication and by introducing an excessive amount of nitrates and mercury into the estuarine system. Eutrophication upsets the ecological balance of the estuaries by overly stimulating the growth of aquatic vegetation. It occurs when waste products which contain excessive phosphates are exposed to sunlight.\(^{16}\) The introduction of excess nitrates into the estuarine system has a more dangerous effect:

Small amounts of nitrate are naturally present in all bodies of water, and living things can tolerate—and often require—nitrate at these low levels. Now, however, nitrate originating in the outflow waters of sewage treatment plants and in the runoff from land treated with chemical fertilizers has begun to build up excessively in the ground water in thirty-eight regions of the United States. . . . An excess of nitrate is poisonous to man and animals.\(^{17}\)

Similarly, poisonous heavy metals are collected in the tissues of living organisms throughout the estuarine food chain. The higher orders of marine life accumulate greater amounts of poisonous metals in their tissues because the tissues of the lower orders which they ingest already contain concentrations of the metals. The ultimate effect may be the poisoning of man.

Numerous rivers have been closed to fishing because of dangerous levels of mercury discovered in the tissue of fish and shellfish. Municipal and industrial waste discharges from Wilmington, North Carolina, and other communities on the Cape Fear River have resulted in severe pollution of the estuaries near Smith Island (Bald Head Island). In the early 1960's, a serious epidemic of viral hepatitis broke out at Camp Lejeune, North Carolina, and the surrounding civilian towns as a result of pollution of the New River and the infection of the oysters harvested there. The source of pollution was determined to be untreated waste from the Marine Corps Base at Camp Lejeune.\(^ {18}\) Fishing and shellfishing

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secondary effects of detergents and other chemicals that have been used to disperse oil slicks in the past and which have added in turn to the environmental toll.


\(^{17}\)Id. at 59-62.

in both the lower Cape Fear River and the New River are now prohibited.\textsuperscript{19} There is a danger of eutrophication in the Pamlico Sound area of North Carolina due to the location of a Texas Gulf Sulphur Company plant which has introduced excessive phosphates into the waters there.\textsuperscript{20} When we consider the municipal sewage and industrial waste problem and its effects upon the estuaries, we must remember that estuaries are the recipients of waste loadings from the upland non-tidal areas representing the upland development of these river systems. In addition, the communities that straddle the estuaries themselves place upon these estuaries the burden of municipal and industrial waste pollution.\textsuperscript{21}

Legislation to eliminate the threat of municipal and industrial waste discharges cannot focus entirely on the coastal region and ignore the waste dissemination of inland communities. One recent legislative innovation developed to deter pollution on a state-wide level is the water pollution fee. Vermont has established stringent water-quality standards for all of its waters, and charges pollutants a fee determined in accordance with a system of effluent charges. The amount of the fee is determined by considering the nature and amount of the effluent discharged, the frequency of discharges, and the effect the discharges have upon the water-quality standards established.\textsuperscript{22} The purpose of the legislation is to prod municipalities and industries into taking immediate action to lower the output of deleterious wastes by making continued pollution costly.

There is some debate about the effects of thermal pollution upon estuarine waters. Warm currents tend to stimulate the growth of nutrients and thus to increase the supply of nutrients available to fish and shellfish; however, excessive and prolonged warmth also may speed eutrophication and thereby prove harmful to the marine life of the estuaries.\textsuperscript{23} Recently Washington enacted legislation vesting a state agency with the power to approve or disapprove the location of thermal power plant sites. The agency’s decision is based on comprehensive ecological studies conducted by independent, neutral contractors.\textsuperscript{24}

\textsuperscript{19}D. Carr, \textit{Death of Sweet Waters} 50 (1966).
\textsuperscript{20}\textit{Regulations}, N.C. Board of Conservation and Development.
The numerous other pollutants in the estuarine habitat include detergents, pesticides, herbicides, and solid waste. It must be remembered that all of these pollutants have the capacity to effect changes in the ecology of the estuary, both by direct poisoning of certain marine food sources and by upsetting the natural balances of the food chains. Ultimately any such changes will affect the capability of the estuarine zone to provide benefits to man.

The other man-influenced degradations of the estuarine environment are the physical alterations of the habitat. Channelization activities, dredge-and-fill projects, impoundment of waters, and commercial development are characteristic examples. Invariably, these actions occur as a result of the quest for economic profit. Because estuarine land is inexpensive in comparison to other land, there is an economic incentive to fill in and build upon the seemingly unproductive marsh. The dredge-and-fill process disrupts the entire ecology of the marsh and its surrounding estuarine waters. Sedimentation caused by the project kills shellfish by suffocation and forces finfish to seek new protective areas. The marsh becomes solid land, and loses its value for food production, fish protection, flood control, and silt filtration.

Only two states in the nation—Alaska and Louisiana—have more estuarine-habitat area than North Carolina’s 2,200,000 acres.

In 1952 the State of North Carolina made an inventory of estuarine wetlands. In 1967 biologists of the Wildlife Resources Commission took that 1952 study—one that covered 13 coastal counties—and used it as a reference point to determine what had occurred in the intervening 15 years. The biologists concluded that in that brief period man had either substantially altered or destroyed 28.5 per cent—some 45,292 acres—of the state’s remaining salt water marshlands.

The study made it obvious that legal controls were necessary, and in 1967 the General Assembly enacted a “dredge registration law,” which required registration of all power-driven earth-moving equipment used in the estuarine zone. In 1969, the General Assembly moved further to control the destruction of North Carolina estuaries by enacting

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25B. Commoner, supra note 18, at 19-21.
26See generally R. Carson, Silent Spring (1962).
28Davis, supra note 6, at 36.
legislation vesting the Department of Conservation and Development with the power to approve or disapprove any proposed alteration of the estuarine zone. Many other states have enacted similar measures. 

Another source of destruction of the estuarine zone is an outgrowth of man's desire to eradicate the mosquito, which breeds extensively in the shallow pools of the salt marshes. To eliminate these pools, state authorities wisely have not used persistent pesticides such as DDT. As an alternative, however, they have embarked on an extensive channelization project designed to drain the marshes and eliminate the stagnant pools essential to the breeding of the salt-marsh mosquito. Such channelization has disrupted the ecology of the estuarine zone to an unknown degree.

Extensive channelization activities have also been carried out by the Corps of Engineers, which has jurisdiction over navigable waters of the estuarine zone. It is believed that the effects of these channelization projects on the ecology of the estuaries have been extremely harmful. A study to determine the extent of the environmental damage was conducted by student interns working with the Wildlife Resources Commission during the summer of 1970. Preliminary reports stressed concern over the rapid decrease in the water table in areas which had been channelized.

Beach-erosion projects and hurricane-protection activities of the Department of Water and Air Resources in North Carolina may also affect the estuarine ecology. Groins and other artificial structures placed along coastal beaches trap sand on the upward side and thus build up the beach in one area. However, tidal action increases on the downward side and often accelerates erosion. One writer has commented:

If man wishes to build his works on the fringes of such a battleground, he must understand that the rules of this ancient battle require the

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32 Staton, Salt Marsh Mosquito Control Programs, in PROCEEDINGS: SYMPOSIUM ON ESTUARINE ECOLOGY, COASTAL WATERS OF NORTH CAROLINA 19-21 (1966).
33 This study, made by William Tarplee, Jr. and Larry Chapman under the supervision of biologist Dr. Darryl Louder of the Wildlife Resources Commission, was the result of an Environmental Intern Program initiated by Governor Robert Scott of North Carolina. Preliminary reports of this study state that “if something is not done to stop channelization in North Carolina, there will be no natural swamps left . . . .” See Tarplee, Effects of Channelization Projects on Stream Habitats, in REPORTS OF NORTH CAROLINA ENVIRONMENTAL INTERNS 52-59 (1970).
34 Id. at 54-59.
beach, the berm, and the dunes to shift constantly before the assault of
the sea. If man tries to change these rules, he can only fail; and in his
failure he may even undermine the fragile hold of these outposts against
the powerful sea. 35

The extensive use of artificial structures to assist nature in the building of
barrier beaches and to protect houses endangered by the shifting sands of
the beaches may bring temporary results; but as a result of these
activities, the tidal currents are shifted and often have an even more
errosive effect upon another section of the beach. Consequent
breakthroughs in the barrier beaches cause salt water to intrude into the
estuaries. This sudden introduction of saline water upsets the balance of
the estuarine ecosystem and kills that marine life which depends upon
less saline water.

Many of the problems confronted by the estuarine zone could be
dissipated if the area could be brought under state or federal control and
thus subjected to knowledgeable planning activities. However, in most
states ownership of the estuarine zone is unclear. Private ownership is
claimed, and the land is subject to the plans of individuals. 36 Land
acquisition costs are high and prohibit large-scale condemnation by the
states. The enormity of the problem of acquisition is illustrated by the
negotiations surrounding North Carolina’s attempt to purchase the Bald
Head Island salt-marsh complex from private developers: North
Carolina would be required to make a capital outlay of as much as
5,500,000 dollars to acquire approximately 3,000 acres of land in a
condemnation proceeding. 37

This discussion has concentrated upon the major problems
confronting the estuarine zone. Clearly, the direct problems of pollution
and physical disruption stem from man’s ignorance of the immense
value of the estuarine habitat. Primary emphasis should be placed upon
educating the public as to this value. Ecology programs which explain
the benefits of the estuarine zone and how the estuary is endangered by
man must be instituted throughout the school systems of the state. The
state should take such steps as are feasible to acquire estuarine land. This

36Rice, supra note 27.
37The 3,000 acres of land in question here consists only of the high ground of the Bald Head
Island complex, which the State of North Carolina acknowledges as being vested in the developers.
The remaining 9,000 acres consists of salt marsh to which the state claims title and upon which the
developers do not contemplate construction.
will require ascertainment of those lands not owned by the state and studies to determine priorities of acquisition. New legislation must be developed and all environmental-protection legislation must be efficiently enforced by the appropriate state agencies. Every effort must be made to increase the efficiency of municipal and industrial facilities. Heavy penalties similar to those imposed by the Vermont legislature may be necessary to prevent private citizens from polluting. Above all, there is a need for total environmental planning in the uses to be permitted of our estuarine zone. We must endeavor to determine realistic long-term uses that are not destructive to the estuarine environment and to limit development to those non-degradatory uses.

KENNETH W. PARSONS

Environmental Law—The Public Trust Doctrine: A Useful Tool in the Preservation of Sand Dunes

The problem of preventing the destruction of sand dunes by private interests should be of grave concern to North Carolina citizens. Indeed, the problem has been recognized by a specific statutory finding that the North Carolina coast "is wholly or in part protected from actions of the Atlantic Ocean and storms thereon by a system of natural or constructed dunes." Our present statutes provide that it shall be unlawful for any person, firm, or corporation in any manner to damage, destroy, or remove any sand dune, or part thereof, lying along the outer banks of this State . . . or to kill, destroy, or remove any trees, shrubbery, grass, or other vegetation growing on sand dunes, without first having obtained a permit as specified herein authorizing such proposed damage, destruction, or removal.

Violation of this statute is a misdemeanor resulting upon conviction in the imposition of a fine of not less than fifty dollars and not more than 500 dollars.

*See note 22 supra.*

*North Carolina has laid the basis for such planning. See Coastal Zone Resources Corporation, A Preliminary Plan for the North Carolina Estuary Study (rev. 1970).*

*N.C. Gen. Stat. § 104B-3 (Supp. 1969).*


*N.C. Gen. Stat. § 104B-12 (Supp. 1969).*

*See Morgan, On the Legal Aspects of North Carolina Coastal Problems, 49 N.C.L. Rev. 857, 864 (1971).*