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## **DREDGING, FILLING, AND THE INALIENABLE PUBLIC TRUST - THE FUTURE OF FLORIDA'S SUBMERGED ENVIRONMENT**

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### ABSTRACT

Dredging and filling, especially to create waterfront property, has had serious adverse effects on Florida's submerged environment. Primary adverse effects of dredging and filling are disturbance or elimination of established aquatic habitats. Dredging and filling peaked in Florida from the 1920's through the 1950's when large tracts of submerged land were sold to attract outsiders. Submerged lands are generally considered to be held in inalienable public trust and legal questions arise concerning sale of these publicly-owned lands. First controls over sale of submerged bottoms and dredging-filling were in the 1957 Bulkhead Act. In 1969 the State established a system of aquatic preserves and the 1970 Legislature passed a bill prohibiting the sale of submerged lands except when clearly in the public interest.

The State of Florida and the Army Corps of Engineers share concurrent jurisdiction in the issuance of dredge-fill permits. The State is authorized under the Bulkhead Act and the Corps under the 1899 River and Harbor Act. Public concern over dredging and filling led to passage of several federal bills, including the National Estuary Study Act of 1968, the National Environmental Policy Act of 1969, and the Water Quality Improvement Act of 1970. The Corps of Engineers have announced they are no longer concerned only with navigation aspects and will give greater consideration to effects on natural resources.

In view of recent state and federal actions concerning sale of submerged lands and dredge-fill permits the future of Florida's submerged environment appears bright. Plans to further protect and conserve our estuaries are needed. Such plans could entail coastal zoning and habitat rehabilitation. Coastal zoning should protect unique bio-ecological systems such as Florida's mangrove swamps. Estuarine areas damaged through dredging may, in some cases, be restored to biological productivity through habitat rehabilitation. This could include transplanting aquatic vegetation, placing rocks or shell on disturbed bottoms, or establishing artificial reefs in estuarine waters.

## INTRODUCTION

This Nation has definitely entered an era of acute environmental awareness. The terms "ecology" and "pollution" can now certainly be labeled household words and many environmental concepts are being slowly, sometimes painfully, recognized and understood by the average citizen. One of the environmental realities that has become rapidly apparent is the piecemeal destruction and degradation of estuaries and coastlines by pollution.

Pollution can take many forms, all of which by definition serve to degrade the quality of the environment. One of the forms of pollution that has had far reaching effects in the state of Florida is dredging and filling, especially for the purpose of creating real estate. Marshall (1968) presented an historical account of dredging and filling in Florida, pointing out that this type of hydraulic engineering is accomplished for a variety of purposes including navigation channels, boat harbors, flood and mosquito control, causeway construction, and the creation of real estate. Sykes (1967) followed the history of a specific dredge-fill case involving real estate development in Florida.

The creation of waterfront property by dredging and filling has had one of the most adverse effects on Florida's estuaries (Woodburn, 1963; Arnold, 1967). Innumerable land development schemes and projects have severely damaged the aquatic environments of several South Florida counties, particularly Dade (Miami), Broward (Ft. Lauderdale vicinity), Palm Beach (Lake Worth area), and Pinellas (St. Petersburg-Clearwater) Counties. The sale of inexpensive, publicly-owned submerged lands to private individuals who subsequently developed these lands into highpriced real estate reached such magnitudes that marine productivity was either destroyed or seriously threatened in these areas (Hutton et al, 1956; Woodburn, 1963; Taylor and Saloman, 1969).

## EFFECTS OF DREDGING AND FILLING

Dredging (both hydraulic and dragline operations) has a variety of possible adverse effects including removal of established marine sediments and associated biota, creation of water depths in which plant communities can no longer survive, creation of "pockets" which can trap organic materials and lead to conditions of low, even anaerobic, oxygen levels, and the always present dangers of siltation, increased water turbidity, and salt water intrusion. Dredging can also change the energy profiles of adjacent shorelines and subsequently affect erosion patterns. The most serious adverse effect of filling is obvious - there is complete, physical elimination of the aquatic habitat and its associated biota. Other adverse effects attributed to filling can be curtailment of tidal or wind-driven circulation, entrapment of debris or detritus, and elimination of previous esthetic and recreational values. Shoreline filling also eliminates the intertidal zone and with it the fringe of mangrove or marsh grass that is so important in the energy cycle of the estuarine eco-system.

Dredging and filling can, in some cases, have beneficial aspects. Dredging can improve water circulation, provide access to previously inaccessible

marsh, and provide buffer zones for fish to escape rapid changes in temperature or salinity (Chapman, 1968). Deposition of spoil materials in deeper, less productive waters may be beneficial in creating eventually productive shallows and new intertidal zones. In some cases, filling may be advisable to eliminate debris-collecting pockets along shorelines. The effects of dredging, filling, and coastal development are well documented (Lunz, 1938; Ingle, 1952; Davis, 1956; Hutton et al, 1956; Bruun and DeGrove, 1959; Mackin, 1961; Hellier and Kornicker, 1962; Odum, 1963; Gunter, Mackin, and Ingle, 1964; Saloman, 1965; Chapman, 1968; Biggs, 1968; Flemer et al, 1968; Gunter, 1969; Taylor and Saloman, 1969).

A comprehensive study on the status of the Nation's estuaries was conducted by the U. S. Fish and Wildlife Service (1970). A summation of the impact which dredge and fill operations have had on coastal areas over the last 20 years was presented in this study. In the state of Florida, some 60,000 acres (8 percent) of basic estuarine habitat has been lost to dredging and filling. California has lost about 256,000 acres (67 percent) of its estuarine area. The Nation as a whole has lost well over 7 percent of its publicly-owned estuaries to dredge-and-fill special interests. These statistics are conservative estimates; actual percentages are probably higher.

### SALE OF SUBMERGED LANDS

Dredging and filling to create real estate at low cost had its peak in Florida from the 1920's through the 1950's. This was before much was really known about the ecology of estuaries or the long-term effects which could result from man's tampering with his environment. During this period the profit motive was the sole consideration regarding use of Florida's finite estuarine resources. The State of Florida, through the Trustees of the Internal Improvement Fund (the Cabinet), virtually gave away enormous tracts of publicly-owned submerged bottoms to attract investment and people from outside the state. Much of this submerged land has subsequently been dredged and filled.

It is interesting to ponder how private interests could have obtained title to these submerged lands. As Latimer (1968) pointed out, most South Atlantic and Gulf Coast states have historically followed the English Common Law riparian system - a system that places submerged lands and navigable waters below the mean high water line in an inalienable trust, to be held in trust by the state for the benefit of all the people. The Trustees of the Internal Improvement Fund have taken the position that the State of Florida owns these submerged areas and has the power to sell them. The very serious question arises, however, as to whether the Trustees ever had a legal right to sell submerged lands held in inalienable public trust. This has become an extremely complex legal question - one that has not yet been resolved. The Lee County Conservation Association intensively examined this question in 1963 and came to the conclusion that the State could not legally sell sovereign submerged bottoms. In a recent, well-documented publication, Plager and Maloney (1968) summarize the problem:

"If a waterbody is navigable, most American jurisdictions, including Florida, consider the bed to be owned by the state in trust for the people. While this trust is often referred to as being an inalienable trust, it has apparently not prevented some states, and especially Florida, from executing deeds to bottoms under navigable waters purporting to convey title to private individuals. Determining the validity of such deeds and the rights attributable to private ownership of navigable bottoms if such deeds are valid presents one of the most complex and confused problem areas of water law."

A complete review of the legal aspects of submerged land ownership in the Atlantic coastal states was presented by Spinner (1969).

The days, however, of massive submerged land sales in Florida are over. As a result of public awareness, pressure, and legislation, the Trustees have drastically changed their land sale policies. In 1957 the "Bulkhead Act" (Sec. 253.12, Florida Statutes, as amended) was passed by the Florida Legislature. This Act provided for a measure of control over sales of submerged lands - requiring such sales to be at least "not contrary" to the public interest. The Bulkhead Act was further strengthened in 1967 by the Randell Act (Ch. 67-393, Fla. Statutes) which provided that a biological survey must be made of each project proposal. Responding to further public concern over continuing losses of estuarine habitat, the Florida Inter-Agency Advisory Committee on Submerged Land Management proposed a system of 26 aquatic preserves in 1968 which were established by the Trustees in 1969. The purpose of these preserves is to set aside valuable areas of coastal habitat for preservation in natural conditions. These areas would be preserved by regulating all human activity (such as dredging and filling) that could affect the preserves. In June, 1970, the Florida Legislature passed a landmark constitutional amendment (S-435; HB-792) that would prohibit future sales of submerged lands except when clearly in the public interest. While this bill is subject to voter approval in the 1970 general election, the Trustees have adopted this policy and have recently denied several applications to purchase sovereign bottoms on the basis that the applicants could not prove such sales to be clearly in the public interest.

In view of recent political developments, it appears that future sales of Florida's submerged environment to private interests will be greatly curtailed. A good indication of this trend is the change in volume of submerged land sales. From 1955 to 1967 the Trustees sold some 28,000 acres, in 1968 sales were down to 151 acres, and in 1969 only 55 acres of public land were sold. One of the biggest problems now is the protection of previously sold marine bottoms. Of considerable help will be a bill (S-522; HB-3955) passed by the 1970 Florida Legislature which empowers the Trustees to condemn and buy back submerged lands conveyed to private interests in the past. Of more immediate value, however, will be continued strict control over future dredging and filling.

## CONTROL OF DREDGING AND FILLING

Since it is generally held that there are no inherent rights to develop submerged lands, even when title is purported to have been conveyed, the title holder or riparian owner must secure permission, in the form of an official permit, to carry out any dredging or filling in navigable waters. In Florida, the state, though the Trustees of the Internal Improvement Fund, and the U. S. Army Corps of Engineers share concurrent jurisdiction in the issuance of dredge and fill permits. Usually permits are also required at the city or county levels.

The Trustees' authority to issue dredge and fill permits was established under the 1957 Bulkhead Act. This Act establishes arbitrary boundaries (bulkhead lines) beyond which no dredging or filling for private development is allowed. Prior to 1957 developers enjoyed almost unlimited freedom to dredge and fill where they pleased. Even after the Bulkhead Act restricted dredging and filling, developers found loopholes, one of the most popular of which was the "after-the-fact" permit. Unscrupulous developers would dredge and fill submerged lands and then apply to the Trustees for an "after-the-fact" permit, which was usually summarily granted with little or no punitive action. As a result of public outrage over these illegal activities, the 1970 Florida Legislature passed a bill (S-591; HB 3728) which would prohibit issuance of any more "after-the-fact" permits. Illegal fills can now be confiscated by the State or the responsible party may be required to restore the land to its original condition.

As previously mentioned, a permit to dredge or fill in navigable waters is also necessary from the U. S. Army Corps of Engineers. The Corps is authorized under Section 10 of the River and Harbor Act of 1899 (30 Stat. 1151; 33 U.S.C. 401) to require a permit for excavating or depositing materials in navigable waters of the United States. Corps jurisdiction over navigable waters extends to the mean high water line, regardless of any arbitrary bulkhead lines established by state or local authority. Section 12 of the River and Harbor Act of 1899 states it is a misdemeanor to violate the provisions of the Act and those guilty shall be punished by fines not more than \$2500 nor less than \$500 or by imprisonment. Section 12 also provides that illegal structures, such as fills, may be required to be removed.

Historically the issuance of a Federal permit for dredging or filling was simply a matter of formality, with effects of such works on navigation being the only consideration (Arnold, 1967). Public concern about natural resources on a national scale brought about the Fish and Wildlife Coordination Act of 1958 (48 Stat. 401 as amended; 16 U.S.C. 661; P.L. 85-624). This Act required the Corps to consider fish and wildlife values involved in dredge and fill applications and led to the Nation's first Corps denial of a dredge-fill project because of harmful ecological effects. This denial, the now famous Zabel-Russell case (Pinellas County, Florida), resulted in the 5th U. S. Circuit Court of Appeals upholding, on July 16, 1970, the right of the Corps of Engineers to deny a permit for works detrimental to the environment. The court's decision pointed out that the Congress has the power to prohibit projects on private submerged lands in navigable waters and that the Congress can delegate this power to the Secretary of the Army.

Continued public concern over the irrevocable alteration of our Nation's coastal areas instigated legislation of the National Estuary Study Act of 1968 (P.L. 90-454). Section 9 of the original bill, H.R. 25, would have required anyone wanting to dredge or fill to obtain formal approval from the Department of the Interior as well as from the Corps of Engineers. This provision of H.R. 25 was amended to death and was not in the final law. As a result of the H.R. 25 hearings, however, a Memorandum of Understanding, dated July 13, 1967, was signed by the Secretary of the Interior and the Secretary of the Army. This understanding provided that there should be full cooperation between the two Federal agencies regarding conservation of the Nation's natural resources affected under Department of the Army permits. Under the National Environmental Policy Act of 1969 (P.L. 91-190) all responsible Federal agencies are now required by law to coordinate and cooperate in any evaluation of major Federal actions, such as the issuance of dredge-fill permits, affecting the quality of the environment. In a news release dated May 19, 1970, the Corps of Engineers (Jacksonville, Fla., District) publicly announced that they were no longer concerned only with the impact a proposed project would have on navigation and would now give greater consideration to effects on the environment and natural resources. An excellent history of Federal legislation affecting the Corps of Engineers and their responsibilities in protecting the Nation's water areas was presented by the U. S. House of Representatives Committee on Government Operations (1970).

A major piece of recent legislation involving state and federal coordination on dredge and fill applications is Section 21 of the Water Quality Improvement Act of 1970 (P.L. 91-224). This Act now requires that all applicants for Corps of Engineers dredge and fill permits provide a certificate from the appropriate state water pollution control agency to the effect that there is reasonable assurance that the proposed activity will be conducted in a manner which will not violate applicable water quality standards.

## THE FUTURE OF FLORIDA'S SUBMERGED ENVIRONMENT

There is a great awakening, both in Florida and in the rest of the Nation, to the seriousness of maintaining a quality environment. Concerned private citizens are becoming environmentally educated and are swelling the ranks of our alert conservation groups. As a result, it will become increasingly more difficult for state and federal agencies to waive or ignore their duties in enforcing laws protecting our natural resources. Special interests that previously enjoyed immunity to exploit publicly-owned resources are now being taken to court. The 1970's have been referred to as the "environmental decade." The 1970's must also, and will, become the "action decade." We no longer can afford to sit back and hide behind the worn cliché of "more research is needed." What is needed instead is more action. It has been estimated by the Marine Resources Committee of the Atlantic Waterfowl Council that over two acres of coastal habitat are being destroyed every hour.

Further action is needed to protect Florida's submerged environment from the dredge and dragline. Actions at the state level concerning sale and development of submerged bottoms are in the right direction. Similarly, the about-face the Army Engineers seem to have taken on dredge-fill permits is a welcome sign. We now need rock hard legislation to affirm these stands and remove them from the possibly temporary category of political expediency. There is no question that the dredging and filling of past proportions must be stopped in Florida. While needs for reasonable access and development must be recognized, it must also be recognized that the public has a right to a healthy and esthetically pleasing aquatic environment. Major decisions must be made on whether a privileged few have the right to block the view and access of Florida's coastlines; whether they have the right to destroy Florida's unique mangrove and marsh systems, and in so doing, destroy the nursery and feeding grounds of vast sport and commercial fisheries enjoyed by all.

The ecologic, economic, and esthetic importance of our coastlines and estuaries are now well known. The scientific literature is full of recent studies in these areas and much of the National Science Foundation's Sea Grant funding is being allocated to estuarine research. It is broadly accepted that estuarine systems are among the most productive areas in the world. These systems also generate large tourist and recreation industries. In an excellent economic analysis, McQuigg (1965) conservatively estimated that Florida's submerged environment was worth a staggering 1¼ billion dollars *per year*. There is no question that the coastlines, estuaries, and other aquatic habitats of not only Florida, but of the entire Nation, must be protected for the future. The question is how to do it.

Probably the best solution is the formulation of a broad, nationwide coastal zoning plan. This concept is receiving wider consideration now and may become the major conservation action of the 1970's. Coastal zoning concepts involving the Atlantic states were discussed by Clark (1967), McBroom (1969), and the U. S. Fish and Wildlife Service (1970). Spinner (1969) presented a detailed history and outline of coastal zoning along the Atlantic coast, including examples of state legislative Acts to preserve marshlands and estuaries.

A good up-to-date survey of the problems and proposals for effective management of the Nation's coastlines can be found in the Conservation Foundation's Newsletter of May, 1970. The most important consideration in coastal zoning would be the establishment of zones based on bio-ecological systems. A case in point is the absolute necessity of preserving the unique red mangrove system of southern Florida. Mangroves provide a principal source of food in the estuarine environment and their destruction by dredging and filling could seriously affect Florida's sport and commercial fisheries (Heald, 1969; Odum, 1970). Marshall (1958) pointed out that Florida's snook (*Centropomus*

*undecimalis*) fishery is closely related to the mangrove habitat and Wade (1969) stated that juvenile tarpon (*Magalops atlanticus*) require a warm estuarine and mangrove environment. Mangroves also serve an important function in buffering the effects of hurricane driven waves. The Florida Power and Light Company (1969) recognized this value and testified to the Atomic Energy Commission:

“A dense stand of mangroves fronts the plant site between State Road A1A and the beach. Those mangroves are native to Florida and have been noted to be extremely effective in reducing and all-but-eliminating hurricane wave action. Plans are to retain the stand of mangroves fronting the plant site in situ and their effectiveness during a P. M. H. occurrence will reduce any potential wave action from the ocean side to a minimum.”

Since red mangroves are largely an intertidal species, growing primarily seaward of the mean high water line, they should be protected as part of the inalienable public trust. Indiscriminate destruction of these plants should be prohibited and programs to re-establish mangroves should be initiated.

### HABITAT REHABILITATION

While coastal zoning would provide a means for protecting the future of shoreline areas, a method whereby we could improve damaged estuarine conditions might be found in the rehabilitation of dredged or silted bottomlands. Key factors in rehabilitating dredged bottoms would be decreasing turbidity and stabilizing disturbed bottom sediments. Increased water turbidity is usually associated with dredging operations and is generally considered of a temporary nature. Tidal and biological action will eventually clear up most waters. This action takes time, however, and if continual dredging and filling is allowed the water will remain turbid. As long as the water column is sufficiently turbid to preclude light penetration poor and unproductive biological conditions will exist. The only solution to this will be continued strict control of present and future dredging operations.

Fine materials (silt and clay) are often distributed in the vicinity of the cutter head of hydraulic dredges. These materials may either settle out and remain in the borrow area or fan out to smother adjacent bottoms. Many factors, however, are involved in silt deposition and there may be situations where dredging has an indirect, rather than direct, effect in causing silt deposits. In a recent study, Taylor and Salman (1969) found that in Boca Ciega Bay sediments in undredged areas averaged 94 percent sand and shell while sediments in dredged canals were 92 percent silt and clay. Bottoms of the latter composition provide unsuitable substrates for benthic communities and this is reflected in the general paucity of sport or commercial species in these areas.

Methods to stabilize poor quality bottoms would essentially require the addition of some material to firm up silt and clay deposits. Such materials might include oyster shells, rocks, transplanted aquatic vegetation, or even the placing of artificial reefs on these bottoms. Judicious placement of sandy or shelly maintenance spoil on silted bottoms could prove beneficial. Chapman (1968) and Vines (1970) presented some considerations on habitat rehabilitation.

Previous studies have demonstrated that transplantation of aquatic vegetation, such as mangroves, turtlegrass, and cordgrass may be a feasible rehabilitation tool (Davis, 1940; Fuss and Kelly, 1969; Larimer, 1969). Phillips and Ingle (1960) examined the requirements of some marine plants in Florida. My personal observations have indicated that red algae, such as *Laurencia* or *Gracilaria*, may be superior to turtlegrass as a habitat for invertebrates. This was also observed in findings by Bader and Tabb (1970) and by Roessler and Zieman (1970). An evaluation of the use of transplanted aquatic

vegetation for habitat rehabilitation would be of great benefit.

The success of artificial reefs in offshore waters is well known. Carlisle, Turner, and Ebert (1964) provided one of the earlier definitive works on this subject. Woodburn (1966) presented a survey of considerations for artificial reefs in Florida. The Bureau of Sport Fisheries and Wildlife, through its Sandy Hook Marine Laboratory, has been conducting extensive studies on artificial fishing reefs along the Atlantic coast. Artificial reefs are generally intended to provide a concentration of fishes for sport fishing purposes. Another use of these reefs could be to provide nursery habitat for juvenile fishes in shallow estuarine waters damaged by dredging or siltation. The use of old car tires, concrete blocks, or even commercially-produced synthetic mats could provide initial settling sites for vegetation, filter feeders, and other invertebrates in areas that otherwise might remain biologically poor. If good water quality could be established these "reefs" would attract and shelter valuable sport and commercial juvenile fishes. The availability and maintenance of good nursery habitat for juveniles is of utmost importance. Without adequate nursery grounds, the time and effort spent attracting the adult fishes has little meaning.

There are indications that the future of Florida's submerged environment may be bright. Legislative action, Trustees' and the Corps of Engineers' policies show signs that most dredging and filling will be drastically curtailed. The key point will be enforcing these laws and policies and reaffirming the principle that our wetlands, marshes, and submerged bottoms are a finite public resource and must truly be held in inalienable trust.

Dredging and filling must be strictly controlled. Dredging should be allowed only to provide and maintain reasonable navigation access or as a water management tool. Responsible agencies must take the initiative in deciding what is reasonable access or what is merely a subterfuge for obtaining fill material. Filling of submerged lands should not be permitted except when clearly proven to be in the public interest.

We must reverse the trends of the past and instead rehabilitate damaged habitats and stringently protect those remaining.

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## **PESTICIDE RESIDUES OF TWENTY MISSISSIPPI DELTA LAKES**

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### ABSTRACT

In 1969 the pesticide concentrations of 20 randomly selected Delta Lakes were evaluated by gas chromatograph. The DDT complex and toxaphene were the prevalent pesticides found in water, fish and bottom sediment. Lake waters were generally low in pesticide residues. Pesticide residues of DDT+metabolites and toxaphene in fish flesh ranged respectively from 0.15-10.60 p.p.m. and 0.0-20.0 p.p.m. Bottom sediment contained from 0.02-3.58 p.p.m. DDT+metabolites, while toxaphene ranged from 0.0-2.47 p.p.m. All lakes surveyed were found to contain pesticides.

### INTRODUCTION

In recent years fishing has declined in the Delta Region of Mississippi. It was