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Flow Gently--Where?

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Although not yet a common household term, the word "estuary" is rapidly gaining visibility because it is now a crisis-related term. Like ozone and phosphate, it was rarely used by the average person until it became the focus of environmental concern.

An estuary is the semi enclosed area on the coast where streams and rivers drain into the sea and mix with the ocean's salt water. Rich in organic nutrients brought in by fresh water, the estuary is where most of the feeding and growth of marine fish and shellfish take place. Oysters spend their lives in the estuaries, and shrimp and some salt water fish come into the rich nursery ground for a growing period and then return to the sea to complete their life cycle. At least two-thirds of the animal population in the oceans spend an essential portion of their life cycle in estuarine waters, or they are dependent upon species that do.

How much longer marine organisms will have this natural breeding, growing, and feeding ground is a matter of concern. Because the estuarine ecology depends on fresh water from rivers, there is fear that the estuaries may eventually succumb to progress. Upstream development--impoundment of water from river basins, industrial, municipal, and agricultural uses, and their return flows--may pose a serious threat to the survival of the system.

The constantly growing needs for river water upstream present the question: Is it possible to continue developing river resources without damaging--even destroying--the valuable estuarine productivity? Last year's Gulf Coast commercial fish catch was valued at $240 million.

To answer that question, it is necessary to know how much fresh water is needed to maintain the productivity of bays and estuaries. By the end of 1979, there should be an answer covering Texas coastal estuaries. Senate Bill 137, passed this year, mandates the Texas Water Development Board in cooperation with the Texas Water Rights

Commission, Texas Water Quality Board, General Land Office, Texas Parks and Wildlife Department, and Texas Coastal and Marine Council to conduct studies that "shall include the development of methods of providing and maintaining ecological environment thereof suitable to their living marine resources."

Reflecting concern for estuarine survival, the bill also provides for "the maintenance of proper ecological environment of the bays and estuaries of Texas and health of related living marine resources." Further it directs the Texas Water Rights Commission to assess--before issuing a water use permit--the effects that the use in question will have on bays and estuaries.

TWDB Study

The TWDB study is two-fold. Biologists now are studying a wide spectrum of important marine organisms in major Texas estuaries. That information will be used to model inflow--variations in both quantity and quality--to determine the impact that changes will have on the system. Different alternatives will be explored to determine ways to meet upstream needs--municipal, industrial, agricultural--and to furnish estuaries an inflow of proper quantity and quality at the proper time.

The study plan brought high praise from Dr. Athelstan Spilhaus, special consultant to the National Oceanic and Atmospheric Administration (NOAA) and "father of Sea Grant," noted for his farsighted and practical approach to the use of natural resources. He said he did not know of any other place which had started with a complete river basin simulation--both quantity and quality--to look at alternative futures and try to assess the ultimate impact on estuaries.

SB 137 is not the first sign of concern or action. Back when the legislature established the Texas Water Development Board, the board was directed to give consideration in the plan to the effect of upstream development on the bays, estuaries, and arms of the Gulf of Mexico. Also the U.S. Department of Interior in 1961 requested studies on the effect of estuarine and marine fisheries in the water development plans for Texas. Actually, the first known report on fresh water inflow into bays and estuaries was made by the Texas Water Development Board in 1967.

Current Investigations

Since that time there have been studies by numerous agencies and institutions to evaluate the relationships between upstream water resources development and estuarine environments. Several studies are currently underway. By the end of 1975, conclusions of a study in the Corpus Christ coastal area are expected; it is a joint project of TWDB and the city of Corpus Christi. Texas Parks and Wildlife Department (TPWD) has been involved in a study of freshwater inflow requirements of San Antonio and Lavac Bays since 1971, among others. Some of the TPWD studies have been conducted independently, and others in cooperation with TWDB.

Dr. Robert E. Stevens, director of Coastal Fisheries, TPWD, has stated that he considers "the job of determining the amount of fresh water necessary to maintain the estuaries of Texas is far larger than the commitment of our agency to this point in time.

"There is no doubt in my mind that the estuary is by far the most variable ecosystem in existence, and as a consequence no group anywhere in the world at this time can, with confidence, state the precise needs of estuaries. New models, techniques and ideas are being formulated daily, but no one should be led to believe that it is and easy task."

"Data, data, data. . .," emphasized Lew Seward, assistant executive director of TWDB, "we're trying to solve this on the basis of solid data."

Dr. Wallace Klussmann, Sea Grant extension program leader at Texas A&M University, agrees. "We need research. The worst thing is a decision based on emotions. After research we need to educate the people with the facts and then let the political body make decisions."

Dr. Carl H. Oppenheimer, marine ecologist of University of Texas Marine Science Institute at Port Aranasas, says, "Let scientists continue collecting data. Right now we do not have enough data to really understand the intricacies."

He goes a step further, "We need a good evaluation of where we stand so that we can determine where our needs are. We need to pull our data bases together. The full cooperation of all state agencies is needed. There should be a push toward a period of information evaluation of our total coastal data to show where continued research and routine research are needed."

The legislature's intent in passing SB 137 is to draw from this collected data some information which will be useful in making decisions. Although studies and research have gone on for many years, the state is no nearer a decision. Rational analysis an synthesis of data at the end of the TWDB study should produce key information to be used as a basis for decisions.

SB 137 appropriated a sum of $250,000 for the investigation. However, Joe Moseley, executive director of Texas Coastal and Marine Council, points out that more than $1 million a year already is being spent on the overall effort.

What's Ahead?

Predictions of the effects of development projects on the fresh water in estuaries would be difficult. Each river and its related estuary present different factors to be considered--natural phenomena, water rights, economics, and productivity.

Is it farfetched to consider the possibility of

- keeping some river basins primarily for river developments and others for gaining maximum benefits from the estuaries?
- maximizing bay and estuary resources as recreational outlets and turning to aquaculture for seafood production?
- managing rivers to release water at an optimum rate for highest benefit to the estuary and thereby reduce damage from flooding and droughts?

The alternative to the natural flow theory which has received most attention is management of stream so that both river development and estuaries share the resource and use it to maximum benefit.

The idea has been discussed. It has been criticized. It has been tried in some states.

Dr. Lyle S. St.. Amant, assistant director of the Louisiana Wild Life and Fisheries Commission, commented on managed flow into estuaries.

"Two things should be kept in mind," he said, "when discussing the water needs of the estuarine systems. Simply adding or subtracting water from the system is not the total answer. The amount of water, the rate at which it enters the system, the manner in which it cycles, the time of year and frequency with which changes occur, all must be integrated and understood before the dynamics of an estuary can be manipulated. This will vary from area to area, and even from embayment to embayment. We have introduced fresh water into the marsh area in Louisiana for some years in attempts to reconstruct situations that existed before man-made levees and water manipulation occurred.

"It is apparent from our studies that controlled introduction of fresh water into the estuaries would be a significant contribution to their management if it can be done with the proper volume of water and within the proper time frame. We have had trouble with this in Louisiana since natural fresh water entering the coast has been associated with flood conditions and has involved tremendous volumes of water entering the system over short periods of time. To simulate this though engineering procedures has been prohibitive to date because of costs and right-of-way problems. Introducing water into the system on a slower basis and in small amounts has proven ineffective and in some instances detrimental because it is rare that unpolluted water can be obtained."

Multiple Purpose

Ecologist Oppenheimer, who has lived and conducted research along the Gulf for 30 years, points out that "the delicately balanced, yet hardy natural ecology of the estuarine zone has been subjected to over 300 years of nature's input. Society must be made aware that the resources of the estuarine zone an coastal zone are transitional in man's society, and thus serve not only those social and economic purposes for which the zone is uniquely valuable, but are also to satisfy requirements of a balanced civilization, wherever organized human society exists. These uses include water supply, industrial, residential and commercial land development, exploitation of mineral resources and fossil fuels, and a place to dispose of the wastes from all these activities.

"Thus it becomes clear that the value of the estuarine environment lies in the multiple purposes it can serve, rather than the economic worth of a single use.

"Objective analysis of historic estuarine use and misuse shows that positive action is needed now to implement rapidly a plan to preserve, conserve, and enhance the finite resources of the coastal zone."

Expressing a similar point of view, Klussmann thinks a balance can be struck. "We can have industry and conservation--a trade-off. Nature is not a set of absolutes. Everything is a compromise. We could still have herds of buffalo roaming the plains if we hadn't chosen corn and cattle; we could have ocean water if we didn't want plastics, gasoline, and food on the table. We must no swing too far in any direction," he warned. "We are a crisis-oriented society."

Trinity River Hearing

The question of supplying estuaries the proper quantity and quality of water at the proper times is now a subject of debate involving the Trinity River basin. At a recent public hearing sponsored by the Trinity River Authority in Anahuac, viewpoints were expressed by a cross section of concerned people: commercial fishermen, scientists, environmentalists, sportsmen, merchants, and public officials. An official statement from NOAA Environmental Assessment Division, Galveston, declared, "The problem of estuaries and freshwater can be solved only when we recognize that estuaries must have freshwater of good quality, and that the benefits so derived may in many cases be equal to or exceed the benefits that tributary runoff would create if it were to be diverted to other purposes."

Joe Lagow, director of Southeast Texas Resources Conservation District, pointed out nature's shortcomings, "Harvest of shrimp, oysters, crabs in Galveston Bay has been off the past three years. One major reason has been the increased flow of flood waters into the bay."

Flooding in 1973 resulted in heavy oyster kill in Galveston Bay. The total harvest for 1973-74 was only 833 barrels more than one month's (November) harvest in 1972. Mortalities of oyster stocks from excessive flood water ranged from 29 to 85 percent on Alabama oyster reefs, over 40 percent on 2,400 acres of Louisiana oyster reefs, and 95 of 100 percent on 2,500 acres in Mississippi.

Lagow added, "There are times we have no fresh water." He stressed the need for river basin management "to control flow of fresh water to insure that the proper balance of freshwater, saltwater, and vital nutrients is maintained so that the fishing industry is not subject to the severe fluctuation it has had in recent years."

Mayor Jimmy McLellan of Beach City on the west bank of Trinity Bay thinks that "once water leaves that mouth of Trinity River, it's gone forever. This is a terrible waste of fresh water."

If management means reduction of water coming into the bay, Donald Moore, area supervisor of National Marine Fisheries Service, Galveston, Predicts a depressing effect on marine productivity.

Sierra Club at present fears that dams may or may not release sufficient quantities of water at appropriate times, and nutrients may or may not have settled out during impoundment.

Pros and cons. Oyster or hydro-electric plants. There is much to be learned before the issue is resolved. But one thing is certain: The State of Texas, through Senate Bill 137, has finally made it clear that it is determined to save from extinction the 2,100 square miles of bays and estuaries on the 400 mile Texas coastline.
Mark your calendar for the next Water for Texas Conference which will be held March 25-26, 1976 at the J. Earl Rudder Conference Tower, TAMU. The theme will be "Water for Food and Fiber Production."