Management in Coastal Wetlands

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Following in the footsteps of previously instituted programs for management of air and water quality our newest national campaign is toward management of our nation's coastlines. Hopefully, once the haze of administrative hassle and political positioning is cleared, the Coastal Zone Management Act will have stimulated in each coastal state, management plans at least as successful as those for air and water pollution control. However, the jury is still out on the effectiveness, especially in our Gulf coast states.

Of particular concern are the coastal wetlands or marshlands. Regulatory authority over wetlands is in most states still fragmented and divided among several agencies each with a specific interest and view of wetland systems. Current permitting authority of the U.S. Army Corps of Engineers, under Section 404 of the Federal Water Pollution Control Act, though a blessing in the planning interim, is currently threatened by proposed amendments and is subject to future legal interpretations.

The ecological value of coastal wetlands has been recognized by researchers for several decades. Although the completeness of the evidence for this value throughout the estuarine ecosystem has been recently debated (Walker, 1973; Odum and Skjei, 1974; and Walker, 1974), there is adequate basis to justify some control over any future alterations within these systems. The value of any acre of land, including coastal marshes, can be approached from four major aspects.

1) *Biological systems support* – nutrient supply, food chain dynamics, vital habitat.
2) *Physical function* – erosion control, storm buffer, water purification, hydrology.
3) *Social Attributes* – recreational use, open space, aesthetics.
4) *Real estate evaluation* – development for economic gain, alteration, or destruction of natural values.

Though the first three aspects can be documented, only the fourth can be readily expressed in terms of dollar value. On the other hand, the specific roles of marshes in biological, physical, or social terms cannot be replaced by, or assumed by, any alternate natural areas and are unique to the marsh/estuarine system. However, real estate utilization can be transferred to alternate sites of equal suitability without the subsequent loss of vital systems.

Over the last three decades a large percentage of coastal marsh habitat has been lost to commercial and residential development. This is a pressing problem in the Gulf of Mexico, with its productive fishery grounds, abundant energy resources, increasing populations, and over 50% of U.S. coastal marshlands. In

Louisiana alone, over 4,500 miles of marshland canals have been dredged, primarily for petroleum exploration (Davis, 1973). With a relatively short coastline Mississippi has experienced loss of more than 12% of its coastal wetlands with up to 42% loss predicted by 1990 (Eleuterius, 1973). Other Gulf coast states are in similar situations. However, not one of the management plans in the Gulf has progressed to the point of submission to the Office of Coastal Zone Management for approval. Alabama and Louisiana have passed, within the last year only, legislation to satisfy OCZM guidlines and it appears that Louisiana may still fail to acquire federal funding (Bockrath and Craig, 1977).

The Florida Coastal Coordinating Council has provided a useful model in designating statewide coastal lands by use categories for preservation, conservation, and development. Refinements and specific details of such a system of permissible uses are immediately needed in all coastal states to wisely direct activities in our marshlands. Designation of critical areas and permissible uses, as well as design of a permitting system to manage costal activities, must be consistent with known ecological principles and must be continuously updated to reflect new information available concerning the systems being managed. Therefore, each agency responsible for coastal management must have continued access to technical expertise and advice, either by staffing or consultant arrangements.

Management plans in coastal wetlands must be based upon an information base from the local situation in each state and cannot rely upon data from other geographic areas with entirely different conditions. Turner and Gosselink (1976) have demonstrated significant changes in plant biomass of *Spartina alterniflora* between Texas and Florida marshes. There is a definite latitudal gradient in annual salt marsh production and turnover rates of *S. alterniflora* in marshes from Maine to Texas, with increasing production and decreasing turnover at lower latitudes (Turner, 1976). Research emphasis has centered upon primary productivity and nutrient availability as a controlling factor. Additional study is necessary on geological and physical parameters.

A great deal of information is available on *S. alterniflora* marshes throughout the U.S. However, other species may be the dominant form and judgements must reflect species data, i.e. *Juncus roemerianus* in Alabama and Mississippi (Hoese, 1967; Eleuterius, 1973; Vittor and Stout, 1975), and *Distichlis spicata* in Texas (Childress, 1960; Schultz, 1960). Nine typical Gulf Coast species were investigated in Mississippi for comparative levels of annual primary productivity, with results ranging from 330 gm^{-2} for *Phragmites communis* to 600 gm^{-2} for *Sagittaria lancifolia* (Cruz, 1974).

Not only must geographic and species variances in wetlands be considered, but intra-species variation must also be a factor in planning. Differences in biomass, growth patterns, and stem density have been determined between marshes of the same species composition and similar geographic location (McIntire and Dunstan, 1975; Steever, et al. 1976; and Oviatt, et al. 1977). Environmental factors responsible for these differences may be tidal features, proximity to industrial and municipal effluents, and natural fluctuations in nutrient availability. Local intra-species variation has potential as a "condition index" of existing wetlands if causes of the variation can be determined.

The dominant vascular vegetation of a marsh reflects environmental conditions, many of which effect all other biotic components of the community. Intercorrelation of these parameters and biota on a local basis can provide some predictive capability from limited data without a complete examination of each particular marsh situation.

Beyond the specific research needs of the individual states, there are a number of areas in which data is not available or incomplete and should be obtained to understand the marshes and estuaries as an ecosystem. Little quantitive data and a somewhat greater amount of indirect evidence is available on the exact contribution of marshes to higher food chain organisms, particularly species of commercial or sport fishing value. Concurrent with this information, more needs to be known about the relationship of inland wetlands to coastal marsh and estuarine vitality. Without adequate knowledge in these two areas, any decisions on preservation or development will be speculative. There is no way now to say how many acres of coastal marshland are necessary to support other living resources.

It should also be kept in mind that marshlands play other than biological roles, and activities in marshlands, which may not be detrimental biologically, may in fact reduce the effectiveness of the marsh in performing its other functions. The overall contribution of an area must be considered and not some narrower aspect.

As coastal acreage becomes more heavily developed, management of wetlands will become more crucial. The marketplace control of supply and demand of coastal real estate will indeed bring pressure to bear for development in wetlands. If continued alteration and destruction of wetlands, even in small incremental stages, is allowed the acres remaining will be increasingly more important in their natural state.

The concept of coastal ecosystem restoration or creation is becoming more popular as technology improves. On the surface, creation of marsh islands and wetland habitat from dredge material seems to be a solution to the loss of wetland areas and the need for disposal sites. Over the last 10 years workers at North Carolina State University, Gulf Coast Research Laboratory, and others have successfully developed techniques for revegetation of dredged material with marsh grasses, dune vegetation, and sea grasses (Seneca, 1974; Eleuterius, 1974). Though these revegetated areas may look exactly like a natural marsh, do they actually have characteristics similar to the natural situation? There is some evidence that if recovery to a somewhat natural condition occurs at all, it may be a lengthy processes and will vary considerably from site to site. It is dangerous, therefore, to rely too heavily on this alternative until more information is available. Creation of new wetlands should not be considered a balance to destruction of natural areas.

In summary, management of coastal areas, in this case wetlands, is no simple task, and it is imperative that baseline data for the geographic area being managed be the guiding information source for any state plan. Economics and property rights conflicts have a way of involving even the most complacent of citizens. The coastal planning agency must, therefore, be armed with all possible factual

support for their decisions and policies and must be on top of any new information which may become available. This task cannot be assumed lightly or haphazardly, but with forethought and a sincere effort to resolve financial, environmental, legal, social, and emotional conflicts and devise a program that will insure a secure future for coastal areas and coastal populations.

LITERATURE CITED

Bockrath, J.T., and F.S. Craig III, (eds.)
1977. Coastal Zone Act. Pages 1-2 *in* Louisiana Coastal Law Rept. No. 27.

Childress, U.R.
1960. Oyster and fisheries investigations of San Antonio and Espiritu Santo Bay (area m - 5). Job Report no. C-2, C-3. Marine Div. Tex. Game Fish Comm.

Cruz, A.A. de la.
1974. Primary productivity of coastal marshes in Mississippi. Gulf Res. Rept. 4: 351-356.

Davis, D.W.
1973. Louisiana canals and their influence on wetland development. Ph.D. Dissertation, Louisiana State University, Baton Rouge, 199 pp.

Eleuterius, L.N.
1973. The marshes of Mississippi. Pages 147-190 *in* J.L. Christmas, ed. Cooperative Gulf of Mexico Estuarine Inventory and Study Mississippi. Gulf Coast Research Laboratory, Ocean Springs, MS.

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1974. A study of plant establishment on dredge spoil in Mississippi Sound and adjacent water. Final Report to U.S. Army Corps of Engineers, Mobile District, Alabama. Contract No. DACWO1-72-C-0001. 327 pp.

Hoese, H.D.
1967. Effect of higher than normal salinities on salt marshes. Contr. Mar. Sci. 12: 249-261.

McIntire, G.L., and W.M. Dunstan.
1975. The seasonal cycle of growth and production in three salt marshes adjacent to the Savannah River. Georgia Marine Science Center. Tech. Rept. Ser. No. 75-2. 19 pp.

Odum, W.E., and S.S. Skjei.
1974. The issue of wetlands preservation and management: A second view. Coastal Zone Manag. J. 1: 151-163.

Oviatt, C.A., S.W. Nixon, and J. Garber.
1977. Variation and evaluation of coastal salt marshes. Environ. Manag. 1: 201-211.

Schultz, R.L.
1960. A survey of the macro-vegetation present in Aransas, Capano, Redfish, Portland, St. Charles Bays, January 1, 1960 to December 31, 1960. Tx. Game Fish Comm., Mar. Lab, Project Reports.

Seneca, E.D.
1974. Stabilization of coastal dredge spoil with *Spartina alterniflora*. Pages 525-530 *in* R.J. Reimold and W.H. Queen, eds. Ecology of Halophytes. Academic Press, New York.

Steever, E.Z., R.S. Warren, and W.A. Niering.
1976. Tidal energy subsidy and standing crop production of *Spartina alterniflora*. Estuar. Coast. Mar. Sci. 4: 473-478.

Turner, R.E.
1976. Geographic variations in salt marsh macrophyte production: A review. Contr. Mar. Sci. 20: 47-68.

_____ and J.G. Gosselink.
1976. A note on standing crops of *Spartina alterniflora* in Texas and Florida. Contr. Mar. Sci. 19: 113-118.

Vittor, B.A., and J.P. Stout.
1975. Delineation of ecological critical areas in the Alabama coastal zone. Prepared for the Alabama Development Office, Dauphin Island Sea Lab. Spec. Rept. No. 75-002. 32 pp.

Walker, R.A.
1973. Wetlands preservation and management on Chesapeake Bay: The role of science in natural resource policy. Coast. Zone Manag. J. 1: 75-101.

_____
1974. Wetlands preservation and management: A rejoinder – economics, science and beyond. Coast. Zone Manag. J. 1: 227-233.