MARSH POND CONSTRUCTION

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ABSTRACT

This paper reports upon our experiences in the construction of coastal marsh ponds in Louisiana. The 1.7 million ha of marshland offers a wide diversity of conditions, some of which would be applicable to the marsh zones of the other coastal states. The basic marsh types (Active Delta Zone, Inactive Delta Zone and Chenier Plain Zone) are described and pond construction in each is discussed.

The soil conditions of the Chenier Plain Zone in southwest Louisiana are generally better suited for the construction and maintenance of long-term levee systems. Initial cost of marsh pond construction and maintenance is extremely high. This is because levees must be built with equipment specifically designed for marsh work and because of the corrosive nature of the moist, saline environment.

INTRODUCTION

The increased interest in mariculture over the past few years has necessitated the construction and maintenance of ponds in an environment which is totally foreign to most of us, the coastal marshes. Until recently these were generally thought of as smelly, distressed wastelands plagued with mosquitoes and abounding with waterfowl. Mineral exploration, housing development and agriculture have greatly increased the values of many ha of marshlands.

Until recent years, the coastal marshlands of Louisiana have

been attractive primarily as producers of an annual crop of fur bearing animals and as hunting areas for migrant waterfowl. Beginning in the early 1940's, extensive mineral developments occurred along the coastline, and this petro-chemical industry has caused a tremendous increase in the appraised value of the coastal wetland section of the state. In addition to this use, extensive agricultural interest in the form of cattle grazing has also played an important role in escalating the value of the firmer marsh zones.

Presently, appraised values along the Louisiana coast ranges from approximately $185.00 per ha in the less stable, Inactive Delta Zone, to several thousand dollars per ha adjacent to metropolitan areas where the potential for industrial and residential development exists. A recent appraisal in one area was $494.00 per ha. However, this appraisal was based upon use of the land for a large power line. A purchase by the Louisiana Wild Life and Fisheries Commission in 1968, of approximately 22,267 ha of marshland at $52.00 a ha may be a more realistic value of marshland, solely for the purpose of producing fish and wildlife species. This transaction did not include the mineral rights and gave the Commission only surface rights to the property.

It is the purpose of this paper to give the novice marsh worker some idea of the conditions that exist and to familiarize him with what has been and may be done. Pond construction techniques will vary in different areas and there are no set rules which will suffice for all situations. Likewise, not all marsh areas are conducive to pond construction and mariculture as we know it today. As a guide, we have used the coastal marshes of Louisiana in our discussion.

In Louisiana, we have a wide selection of marsh situations which should include most conditions experienced in other neighboring coastal states. Our marshes cover over 1.6 million ha, skirt the entire coastline of the state, and contain one of the largest rivers in the world--the Mississippi. The marshland elevation varies from minus 60 cm to plus 60 cm above mean sea level, excluding natural levees and cheniers. Soils range from solid clay to 88% organic materials depending upon the vegetative history of the area (Chabreck, 1970). Water salinities may vary from freshwater to sea strength. The Mississippi River has affected most all of coastal Louisiana and is largely responsible for the major marsh zones (Figure 1). The divisions of different marsh zones as reported by Chabreck (1970) are as follows: Active Delta, Inactive Delta and Chenier Plain. Also, a short discussion is presented on pond construction in sandy beach situations.

DESCRIPTION OF MARSH ZONES

The Active Delta marshes extend from Venice, Louisiana south to the mouth of the Mississippi River. These marshlands consist of 111,255 ha of deltaic marshes, shallow ponds, passes, bayous,

canals, and mudflats, and lie at about sea level. The only areas not subject to overflow are some of the natural levee systems. Topography, water levels and water salinity of the Active Delta are directly affected by the Mississippi River and Gulf tides. Saltwater may move upstream in the form of a wedge below the less dense river water during periods of low river discharge. The average daily tidal range at the end of the passes or in the Gulf is approximately 36 to 41 cm and is approximately 31 cm at the head of passes (Carver, 1965). The effect of tide decreases with distance from the Gulf. Fluctuation of marsh water levels due to wind are stronger than lunar tides.

The Inactive Delta marshes of Louisiana are approximately 1,111,457 ha in size and extend from the Active Delta to the western edge of Vermilion Bay. These marshes are basically similar to the Active Delta; however, this area is characterized as having relatively high soil salinities, experiences constant subsidence, and contains floating mats of living and dead roots. The Bayou Terre Aux Boeuf area is one such example. Here, one could find a compact crust of matted roots and mineral soils, ranging in thickness from 31 to 38 cm. Under this is a highly organic peat ranging in depth up to 9 m (O'Neil, 1949). Fresh Panicum sp. marshes largely make up the other one-half of this zone. Dissolved oxygen conditions are often extremely critical due to decomposition in closed systems.

The third type of marsh zone is the Chenier Plain marshes of southwest Louisiana. These marshes are composed of approximately 482,550 ha and extend from the western edge of Vermilion Bay to the Texas boundary. Soils in this area are of a soft organic clay and numerous stranded beach ridges or "cheniers" are located in the marsh interior. This zone may be generally classed as having shallow peat soils ranging in depth to only 1.5 to 1.8 m.

POND CONSTRUCTION

Active Delta

Construction of levees to contain water in the Active Delta Zone is almost impossible because of the extremely fluid nature of the soil. The only stable levees in existance today were placed on pass banks or on utilized natural levee systems. Many were built through the initial use of hydraulic dredging equipment and later were built up by draglines.

The Freeport Sulphur Company built a 243 ha freshwater reservoir approximately 18 years ago near the mouth of the Mississippi River. The construction of this impoundment contradicted the belief of many that impoundments could not be built under conditions experienced in the Active Delta.

Smaller ponds could possibly be built by the careful selection and building of levee sites, but it is doubtful if this would