ENVIRONMENTAL CONDITIONS OF A BACKFILLED PIPELINE CANAL FOUR YEARS AFTER CONSTRUCTION

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Abstract. We studied the environmental conditions along 56 km of a backfilled pipeline canal four years after construction was completed. The canal traverses fresh, intermediate, brackish, and saline marshes in southeastern Louisiana. Over one-third of the sampling sections in the fresh intermediate marsh regained more than 60% vegetation cover; mean canal depth was 44 cm, and submerged aquatic vegetation (SAV) covered 59% of the bottom. The brackish marsh sections revegetated only where the canal passed through the mineral soils of the Bayou Lafourche natural levee; mean canal depth was 67 cm, and SAV covered 23% of the bottom. The salt marsh revegetated poorly; the area remained 80% open water, as it was before canal construction. Mean canal depth was 59 cm, and SAV covered 10% of the bottom. Backfilling did not return the marsh to its original condition, but the shallow ponds that formed along the canal resemble natural ponds in depth and vegetation.

Key words: Coastal marsh, backfilling, canals, dredging, revegetation.

INTRODUCTION

Louisiana has approximately 14,000 km² of coastal marsh, over 50% of the total marsh area of the southeastern United States (Wilson 1968). These marshes provide the state and nation with many valuable resources. In 1983, Louisiana marshlands yielded over $250 million worth of fur, shellfish, and finfish, and wintered 5-10 million waterfowl (Linscomb and O'Neil 1982, Byrd and Smith 1984, U.S. Department of Commerce 1984). The wetlands also assimilate toxins,
filter wastes, and protect inland Louisiana from the full fury of tropical storms (Davis 1983). A large percentage of Louisiana’s oil and natural gas, valued at over $30 billion, also comes from these marshlands (State Energy Overview 1982, Louisiana Labor Market Information 1985).

These valuable wetlands are being lost at a geometrically increasing rate, presently estimated at 102 km$^2$ per year (Gagliano et al. 1981). Although some of this loss is due to natural subsidence, erosion, and a lack of Mississippi River sediments to rebuild marshes, 25%-89% of the loss is directly or indirectly caused by canal dredging (Gagliano 1973, Craig et al. 1979, Scaife et al. 1983, Turner et al. 1983, Deegan et al. 1984). Most canals are dredged for the oil and gas industry (Louisiana Department of Natural Resources 1982).

Adverse effects, both direct and indirect, have been attributed to canal dredging. Many researchers have recognized the direct destruction of marshes converted to deep canals and upland dredged material deposits (Corliss and Trent 1971, McGinnis et al. 1972, St. Amant 1972, Gagliano 1974). Indirect impacts may affect larger areas and thus be more damaging. They include the alteration of natural hydrologic and sedimentation patterns, salt- and freshwater intrusion, and increased erosion rates caused by wind and boat wakes. Changes in water depths and substrates cause low dissolved oxygen levels in stagnant, deep canals, increased turbidity, rapid draining of wetlands during low tides, and prolonged impounding of wetlands by interconnecting spoil banks and the subsequent death of marsh plants by waterlogging (Gagliano 1973, Adkins and Bowman 1976, Stone et al. 1978, Craig et al. 1979, Hopkinson and Day 1979, Lindall et al. 1979, Stone and McHugh 1979, Gagliano et al. 1981, Chabreck 1982, Johnson and Gosselink 1982, Swenson 1983, Turner et al. 1983, Turner 1984). Although some researchers may question the degree to which canals impact marshes, few question that canals and their adjacent dredged material deposits have an overall adverse effect on the marsh ecosystem.

Backfilling that returns dredged material to the canal has been suggested by researchers in Louisiana and Florida as one way of mitigating some of the adverse effects. Some pipeline canals are now being backfilled after the pipelines have been installed, and the practice may prove effective for oil and gas access canals as well (Adkins and Bowman 1976, Lindall et al. 1979, Bahr et al. 1983, Turner et al. 1983, Gosselink 1984, Neill and Turner 1984).

Figure 1 illustrates conceptually the major differences between open and backfilled canals, assuming success in backfilling. The canals represented in the schematic are the same width, but the open canal is deep and anoxic and has dredged material banks with flood-intolerant vegetation. Deteriorating marshes surround the open canal, and boat traffic widens its shores. The backfilled canal has little or no exposed dredged material. It is transformed into shallow ponds and ditches, allowing overbank flooding and a more natural marsh water regime (Swenson 1983). How well this ideal is approached in practice is uncertain. Little good information is available about the success of backfilling.