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STUDY TITLE: University Research Initiative on the Effects of Offshore Petroleum Development in the Gulf of Mexico

REPORT TITLE: Backfilling Canals as a Wetland Restoration Technique in Coastal Louisiana

CONTRACT NUMBER: 14-35-0001-30470

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KEY WORDS: Wetland, dredging, restoration, Louisiana, coastal zone, canals, direct impacts, indirect impacts, marshes, habitat

BACKGROUND: Canals have been dredged in coastal Louisiana wetlands for oil and gas exploration and extraction since 1938. Historically, most waterways were simply abandoned after drilling was completed. Today, thousands of miles of canals crisscross these wetlands. These canals are typically dredged to 2.5 m depth and are 20 to 40 wide. Canal lengths vary from 100 m to several 1000s m in the case of OCS pipeline canals.

Studies have linked dredged canals to a number of detrimental effects on the wetland environment including alterations in salinity, flooding and draining patterns, direct loss of marsh by conversion to open water, and increases in marsh erosion rates. These effects have led state and federal agencies charged with managing the wetland resource to look for methods of mitigating canal impacts. One possible method of managing spoil banks after the abandonment of a dredging site is to return spoil material from the spoil banks to the canal with the hope that marsh vegetation will be reestablished on the old spoil banks and in the canal. The movement of former spoil bank material back into the canal is referred to as "backfilling".

OBJECTIVES: The purpose of this study was to investigate the factors that affect backfilling success and to develop a model that could be used by managers to predict the success of backfilling. We examined the sites of a previous study to document and interpret changes occurring since 1983 and to statistically model the combined data derived from these new and previous analyses. Specifically, we wanted to determine the recovery rates of vegetation, water depth, and soils in backfilled canals, 'restored' spoil banks, and in nearby marshes, and quantify the influence of plugging canals on these rates. We wanted to know if the initial growth of submerged aquatic vegetation was maintained, if additional growth appeared, and if the growth of submerged aquatics was sustained after the plug washed out.

DESCRIPTION: The backfilled canals examined in 1983/4 were re-examined to determine recent changes in (1) soils, (2) vegetative cover, and (3) fish use. A statistical model of the data was constructed using the resulting data. These backfilled canals are occasionally plugged (or at least were plugged several years ago) and represent virtually all backfilled canals in Louisiana. Hypotheses were tested about restoration through backfilling were that success is a function of: (1) canal length, (2) canal age, (3) marsh soil organic matter content, (4) presence of a plug at the mouth of the canal, (5) the percentage of the available spoil material returned to the canal, and (6) mitigation purpose. Field observations were made to determine the success of restoration and to collect information on environmental conditions suspected of influencing restoration success. All canals were photographed in color infrared imagery in November 1990 using an aircraft-mounted large-format (5 inch x 5 inch) camera. The imagery was taken from an altitude of approximately 916 m. An 8 inch x 8 inch photographs was developed from the resulting transparencies to determine the percentage of the old spoil bank area that is now marsh vegetation, upland vegetation, and open water. The 1990 photography was also visually compared to oblique black and white photographs taken during the earlier study.

SIGNIFICANT CONCLUSIONS: Backfilling is an economical and successful means of managing canals and spoil banks in coastal Louisiana. It demonstrates stability over decades. It is a reasonably short management action, requiring existing well-proven equipment and no on-site maintenance. Fish and waterfowl habitats are produced and there are thousands of hectares of canal and spoil banks available for backfilling. There will be many more available in the future.

STUDY RESULTS: The major factors determining backfilling restoration success are the canal depth and length, soil type, locale, dredge operator skill, and permitting conditions. Plugging the canal has no apparent effect on water depth or vegetation cover, with one exception. Submerged aquatic vegetation is more frequently observed behind backfilled canals with plugs than in backfilled canals without plugs. Canal age, soil organic matter content, and restoration on-site or off-site were the most important predictors of canal depth. Canal length and percentage of spoil returned had the greatest effect on vegetation cover. Backfilled canals were shallower if they were older, in soils lower in organic matter, and backfilled for mitigation away from the permit site.

Vegetation cover increased with increased canal length and percentage of spoil material returned.

Backfilling the canal would restore wetlands at a cost of $1,200 to $3,400/ha, depending on whether only the direct, or also the indirect impacts, respectively, where included. The restoration costs compare favorably with funded restoration projects in south Louisiana, including structural marsh management and river diversions.

STUDY PRODUCT: Turner, R. E., J. M. Lee, and C. Neill. 1993. Backfilling Canals as a Wetland Restoration Technique in Coastal Louisiana. A final report by Louisiana Universities Marine Consortium for the U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Office, New Orleans, Louisiana. Contract no. 14-35-0001-30470 OCS Study MMS 94-0026. 47 pp.

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