ELSEVIER

Ecological Economics 33 (2000) 93–101

ECOLOGICAL ECONOMICS

www.elsevier.com/locate/ecolecon

ANALYSIS

An economic analysis of using wetlands for treatment of shrimp processing wastewater — a case study in Dulac, LA

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Received 17 December 1998; received in revised form 14 September 1999; accepted 14 September 1999

Abstract

Two crucial environmental problems in Louisiana are high rates of wetland loss and surface water pollution. Using wetlands for wastewater treatment can address both of these concerns by reducing the amount of pollutant discharge into surface water bodies while simultaneously serving to restore and replenish deteriorating marshes by enhancing productivity and accretion. Using wetlands for wastewater assimilation can also result in considerable cost savings when compared with conventional, non-wetlands wastewater treatment options. In order to determine these cost savings in a specific case, an avoided cost economic analysis was performed for two potential wastewater treatment options for a shrimp processor in Dulac, LA: (1) conventional, on-site treatment with dissolved air flotation (DAF); and (2) wetland treatment. Annualized costs for DAF implementation are ≈$208 000/year for 25 years. Wetland treatment costs around 25% of DAF with an annual cost of ≈$63 000. Yearly savings would be almost $150 000. This is a capitalized cost savings of over $1.5 million.

Keywords: Wastewater treatment avoided cost economic analysis; Natural systems; Wetland management; Nutrient reduction

1. Introduction

1.1. Background

Louisiana is one of the nation's leaders in seafood production with an annual production

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0921-8009/00/$ - see front matter
PII: S0921-8009(99)00130-5

rate of over half a billion kilograms, valued in excess of $250 million dockside (US DOC, 1997). Zachritz and Malone (1991) identified over 690 seafood processors in Louisiana, most of which are located in the coastal zone. Dulac, LA, consistently ranks in the top ten US ports for value of fishery landings, and four other Louisiana ports rank in the top ten (US DOC, 1997). Currently, seafood processors in Dulac, LA, are permitted by the State of Louisiana to discharge all the untreated wastewater used during the production process into Bayou Grand Caillou. The State of Louisiana, through delegated authority from the US EPA, has issued Louisiana Pollution Discharge Elimination System (LPDES) permits that require only removal of shell material. However, the remaining untreated effluents cause low dissolved oxygen (DO) concentrations in the bayou that violate the water quality standards for DO criterion (Waldon, 1991). More importantly, the untreated waste input high amounts of nutrients, such as nitrogen and phosphorus, which contribute to the eutrophication of coastal waters. This increase in primary productivity is one probable cause for the persistent hypoxic zone affecting much of the Gulf of Mexico during the summer months (Rabalais et al., 1994, 1996). Additionally, Louisiana suffers high rates of wetland loss (Britsch and Dunbar, 1993). Using wetlands for wastewater treatment can reduce the amount of pollutants discharged into surface water bodies while simultaneously serving to help restore and replenish deteriorating marshes by enhancing productivity and accretion. We conducted this study to determine the ecological and economic feasibility of using wetlands for treatment of shrimp processing effluent in Dulac, LA (Day et al., 1998). This report presents the findings of the economic portion of that feasibility analysis.

1.2. Treatment options

The wastewater treatment options for seafood processors in Dulac, LA, are the same as they have been for the past 20 years (Breaux et al., 1995): (1) continue disposal into Bayou Grand Caillou; (2) discharge into an expanded treatment plant in Houma ($\approx$ 32 km (20 miles) away); (3) treat wastes at the individual plants before discharging into Bayou Grand Caillou; or (4) discharge into the wetlands. Many consider options (2) and (3) to be too expensive to be feasible solutions to this problem. Pumping wastewater for extended distances or on-site treatment is often prohibitively expensive for operations such as the shrimp processors in Dulac, LA. This paper considers options (3) and (4) as they pertain to shrimp processors. Breaux et al. (1995) and Breaux (1992) performed a generalized preliminary avoided cost estimate of options (3) and (4) for seafood processors in Dulac, LA. This study builds from those previous efforts by focusing specifically on one processor, Sea Tang Fisheries, Inc, 6320 Grand Caillou Road, Dulac, LA 70353 (hereafter Sea Tang), and the costs associated with conventional on-site treatment or wetland treatment.

1.3. Wetlands treatment

Previous studies indicate that both natural and constructed wetlands can purify wastewater effluents (Richardson and Davis, 1987; Reed, 1991; Kadlec and Knight, 1996). Wetlands are efficient at removing excess nutrients and pollutants by physical settling and filtration, chemical precipitation and adsorption, and biological metabolic processes that result in burial, storage in vegetation, and denitrification (Kadlec and Alvord, 1989; Patrick, 1990; Breaux and Day, 1994). US EPA (1986) conducted a study in Alabama that successfully used wetlands to treat shrimp wastewater.

Breaux and Day (1994) identified four primary benefits derived from wetlands wastewater treatment in Louisiana: (1) improved surface water quality; (2) increased accretion rates to balance subsidence; (3) increased productivity of vegetation; and (4) the financial savings of capital not invested in conventional advanced secondary and tertiary treatment systems. Subsidence in deltas results naturally from compaction, consolidation and dewatering of sediments. Localized sinking can also be increased due to withdrawals of water, oil, and gas. If wetlands in deltas do not accrete