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Growth rates of baldcypress (*Taxodium distichum*) seedlings in a treated effluent assimilation marsh

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ABSTRACT

Wetlands have proven effective at improving water quality of treated wastewater effluent, which in turn promotes increased primary productivity and vertical accretion. Baldcypress (*Taxodium distichum*) seedlings grown under different conditions (bare root and potted) were planted in four subunits of an effluent assimilation marsh and a control marsh in southeast Louisiana, USA, and basal diameter growth was monitored over one growing season. Mean basal diameter growth for seedlings in the assimilation subunits ranged from 16.1 (±1.4) mm to 9.5 (±0.9) mm, whereas growth for seedlings planted in the control marsh was 6.4 (±0.9) mm. Seedlings planted nearest the outfall experienced greater basal diameter growth (18.1 ± 2.6) compared to those planted 700 m away (8.0 ± 0.9), with growth generally decreasing with distance. Potted seedlings experienced greater growth (19.1 ± 1.0 and 20.6 ± 1.0 for five-month-olds and ten-month olds, respectively) than bare root seedlings (4.6 ± 0.6 and 4.0 ± 0.4 for one-year-olds and two-year olds, respectively). Planting assimilation marshes with baldcypress seedlings can be an effective restoration tool for coastal Louisiana, which will provide hurricane protection and improved surface water quality. Wastewater treatment wetlands may offer an effective tool for restoring coastal baldcypress (*T. distichum*)–water tupelo (*Nyssa aquatic*) swamps in Louisiana.

1. Introduction

Wetlands of coastal Louisiana (USA) perform important ecological functions which result in economic benefits including improved water quality, nutrient cycling, endangered species habitat, fisheries nurseries, recreational hunting and ecotourism (COAST, 1998). However, the state has experienced wetland loss on a grand scale (Barras et al., 1994; Day et al., 2000, 2007). Baldcypress–water tupelo (*Taxodium distichum–Nyssa aquatica*) swamps once comprised 90% of the habitat found in the Lake Maurepas wetland complex in southeast Louisiana (Saucier, 1963). The majority of the Maurepas swamp complex is described as degraded or degrading (Shaffer et al., 2009a).

The Maurepas swamp requires restoration efforts that provide a source of reliable fresh water to prevent long-term salinity pulses (Thomson et al., 2002) and to increase vertical accretion, through either direct sediment deposition or organic soil formation. One potential source of fresh water for restoration efforts is secondarily treated municipal effluent. Both natural and constructed wetland systems have been shown to effectively treat effluent to tertiary levels (Kadlec and Knight, 1996). The benefits of treating sewage effluent using wetlands include improved water quality (Day et al., 2004), financial and energy savings (Ko et al., 2004), increased vegetative production (Hesse et al., 1998; Day et al., 2004, 2006; Brantley et al., 2008), and enhanced soil expansion (Breaux and Day, 1994; Rybczyk et al., 2002; Brantley et al., 2008).

In the fall of 2006, the city of Hammond, LA began discharging 11,356–15,141 cubic meters per day ($m^3\ day^{-1}$) of disinfected, secondarily treated municipal wastewater in Four Mile Marsh (Fig. 1), just south of the town of Ponchatoula and north of the Joyce Wildlife Management Area (JWMA), which is part of the Maurepas swamp complex. Four Mile Marsh was isolated from its source of fresh water and nutrients following the construction of South Slough, a man-made canal which now intercepts surface flow from the north. The original goal of the project was to achieve improved water quality but a secondary goal was to revitalize the periodically saltwater-influenced marsh and JWMA through freshwater and nutrient inputs via the discharge of treated wastewater.

There is a potential for a loss in species richness in treatment wetlands (Reinartz and Warne, 1993). In an effort to prevent a loss of diversity and to generate a baldcypress–water tupelo swamp

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