



Created Wetlands for the Reduction of Organic Carbon Loading: a case study at Myrtle Grove, Louisiana

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The CHS Inc. Grain Export Terminal is located ~35 km south of New Orleans along the western bank of the Mississippi River. Grain products storage capacity of the facility is 6.5 million bushels (165,100 tons) and the loading capacity is 90,000 bushels (2,300 tons) per hour. CHS discharges stormwater runoff from the facility into Bayou Dupont under LDEQ LPDES permit with limits for total organic carbon (TOC) of 50 mg/L daily maximum, however, average TOC concentration discharged by the facility from 1/31/07 to 8/31/08 was 82.8 mg/L.

The CHS stormwater wetlands were designed with a permanent pond and meandering wetland channel, as well as a sediment forebay. The combined standing water volume of the CHS wetlands is 3,596 m³, and the peak design volume is 14,729 m³, which would raise water levels in the ponds by 70 cm. The volume of stormwater runoff from a 1-hour 10-year storm (9.4 cm) at the CHS facility is 11,750 m³, and would raise water levels by 73 cm, which would be accommodated by the available freeboard of the wetlands of ~1 m.

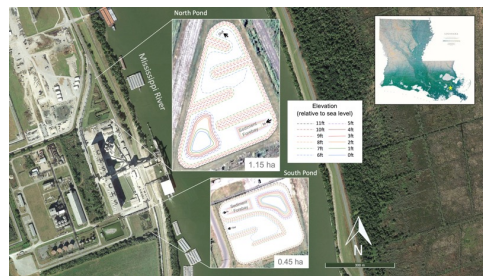
for analysis of TOC and TSS using EPA-certified methods.

A subset of 57 baldcypress seedlings were tagged with identification numbers in the North Pond and 44 trees in the South Pond. The diameter at breast height (dbh) of all tagged trees were measured during winter directly above and below the identification tag located approximately 4.5 ft above the ground. Procedures outlined in the Forest Inventory and Analysis National Core Field Guide (version 7.2) were followed (USDA 2017).



Whistling ducks occupying the North Pond on May 5, 2022.

Tree biomass at the end of the study ranged from 17.4 to 664.3 kg/tree at the North pond and from 42.9 to 410.8 kg/tree at the South pond.



Satellite imagery of the CHS facility and the two stormwater wetlands. Insets are of original design schematics of the ponds indicating general depth contours, sediment traps, and inlets and outlets.



The North Pond in October 2014 (dry conditions). The CHS facility is in the background, adjacent to the Mississippi River.

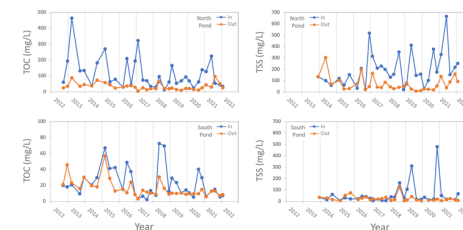
During March 2012, approximately 800 baldcypress (*Taxodium distichum*) seedlings were planted in the two wetlands. Herbaceous species, such as thinleaf cattail (*Typha domingensis*), pickerelweed (*Pontederia cordata* L.), smartweed (*Polygonum punctatum*), arrowhead (*Sagittaria latifolia*), and bulltongue (*Sagittaria lancifolia*) colonized the wetlands naturally.

METHODS

From 2012 to 2022, water samples were collected two to four times per year from each wetland for analysis of TOC and TSS. The samples were collected at the inlet and outlet of each wetland. CRI staff collected the water samples and transported them to an EPA-certified laboratory

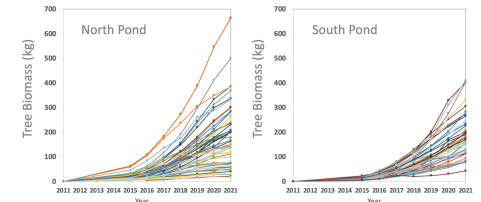
RESULTS

The North Pond had a mean TOC concentration of 112.6±11.7 mg/L±se at the inlet and 33.3±2.5 mg/L±se at the outlet, which were significantly different from each other (p<0.0001). Mean TOC concentrations at the South Pond were 23.0±2.3 and 16.2±1.4 mg/L±se at the inlet and outlet, respectively, and were not significantly different.



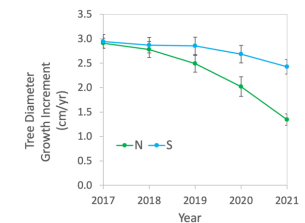
Total organic carbon (TOC) and total suspended sediments (TSS) at the inlet (blue) and outlet (orange) of the North and South Ponds over time. Note the difference in scale (y-axis) for North and South Pond TOC.

Mean TSS concentrations at the North Pond were 196.5±21.2 mg/L±se at the inlet and significantly lower (p<0.0001) at the outlet (21.2 mg/L±se). The South Pond had mean TSS concentrations of 57.9±14.6 mg/L±se at the inlet and 25.1±3.4 mg/L±se at the outlet, but were not significantly different.



Biomass of tagged trees over time in the North and South ponds.

Growth increments declined at different rates through time, with the North site having a significantly lower (p<0.0001) growth increment of 1.3 cm/yr compared to 2.4 cm/yr at the South site.



The mean annual dbh growth increment at the North and South ponds.

The results of surface water and vegetation monitoring showed that the ponds resulted in a consistent and sustained reduction of TOC and TSS and enhanced growth of cypress seedlings.