

Student Water Monitoring on Bayou St. John during Control Structure Removal

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Abstract

Presented are the results of an on-going water monitoring project conducted within Bayou St. John. The purpose of this project was to record changes to water quality from the removal of the Bayou St. John water control system. Based on the findings of the Bayou St. John Comprehensive Management Plan, the removal of the control system is projected to reduce salinity, increase dissolved oxygen, and encourage fish and wildlife propagation within Bayou St. John by reconnecting with the larger more ecologically diverse Lake Pontchartrain.

Introduction

Bayou St. John is a natural water body historically serving as drainage and portage for the New Orleans region. In 1931 a lock system was constructed at the point where Bayou St. John meets Lake Pontchartrain, with additional concrete levees and bridges added later by the Works Progress Administration. The lock system was replaced in 1962 with a flood control structure incorporating the opening and closing of valve controlled culverts and a recirculation system designed to look like a waterfall. In the late 1970's and early 1980's the New Orleans Sewer Board proposed permanent closure of the bayou. In response, the public petitioned that a new flood control system to be installed instead. With continued public support, plans were adopted in 2010 to remove the flood control system and open the bayou to receive waters from Lake Pontchartrain.

In late 2012, the old water control structure at Robert E. Lee Dr. was removed. The Lake Pontchartrain Basin Foundation (LPBF) performed water quality monitoring prior to, during, and following the removal of the structure at sites along the length of Bayou St. John to measure any changes to water quality as a result of removing the structure (Figures 1a and 1b).

Figure 1a. Bayou St. John Control Structure



Figure 1b. Structure Removed



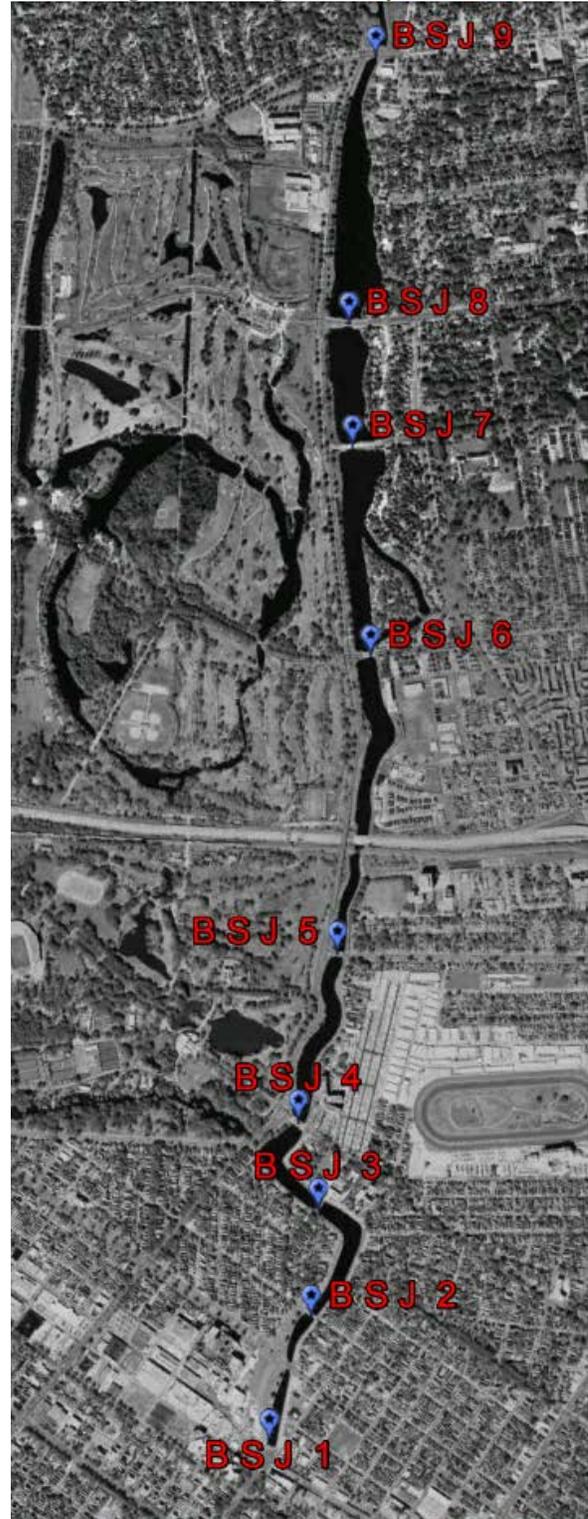
Methods

In cooperation with local universities, LPBF trained intern students to collect bi-weekly water quality samples at locations along Bayou St. John. Sampling began in July 2002 and continues to the present. Sampling conducted through July 2013 was considered for this paper. Between 10/29/13 and 2/5/13 there was a lull in sampling due to the end of the fall semester and the beginning of the spring.

LPBF trained the student interns in the use of EPA-approved water sampling meters and sampling techniques. All water sampling and analyses were performed *in situ*. A YSI 85meter was used to record dissolved oxygen (milligrams per liter, mg/l), specific conductance (millisiemens, mS), salinity (parts per thousand, ppt) and water temperature (degrees Celsius, °C). To test water clarity, the HACH 2100 Turbidimeter recorded the average of ten readings in Nephelometric Turbidity Units (NTUs). Each meter was calibrated twice annually and inspected once per month to insure proper functionality.

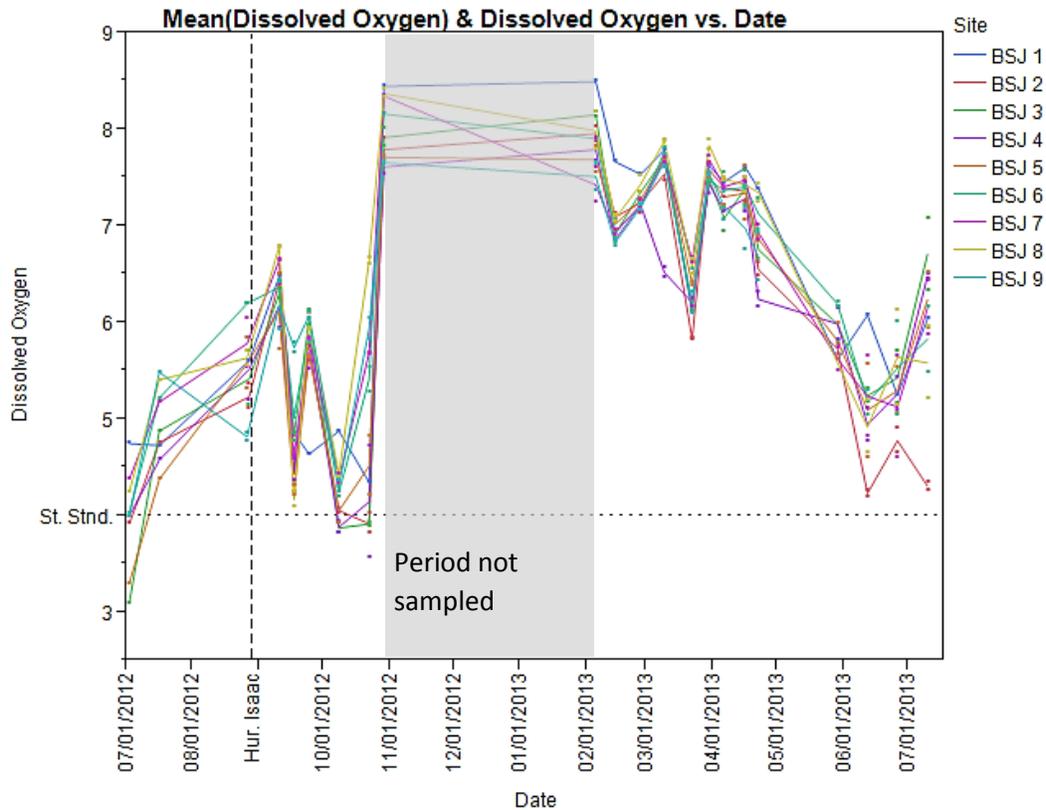
The nine locations along the entire length of Bayou St. John (Figure 2) were sampled bi-weekly beginning in July 2012 and continuing to present. Each site was chosen based on proximity to land features and access for monitors to collect readings at the surface and mid-point of the water column. Data collected in the field was then entered into an Excel database with analytics being conducted by both students and staff. The statistical program JMP was utilized for statistical analyses.

Figure 2. Bayou St. John Water Quality Monitoring Sites. (image courtesy of USGS)



Dissolved oxygen also fluctuated and rose in response to temporary gate openings during the test phase and remained elevated in January when the control structure was removed. Since January of 2013, dissolved oxygen levels have fluctuated and showed the expected decrease with corresponding rising temperatures in spring but remained above the state standard of 4 mg/l.

Figure 4. Mean dissolved oxygen for Bayou St. John sites by date



Discussion

LPBF began monitoring Bayou St. John in July 2012 to document the water quality impacts of the removal of an old water control structure. During the monitoring period both salinity and dissolved oxygen responded dramatically to the openings but leveled out after a few months. While it difficult to gauge what impact the removal of the flood control system will have in the long term, it is clear that water from the lake is mixing throughout bayou St. John. With the influx of lake water, conditions are favorable to increase the amount and variety of aquatic habitat, as well as aesthetically improve conditions to encourage recreation along the bayou.

The program also developed partnerships with local universities by having students in the Environmental Science disciplines hone their skills alongside skilled LPBF staff. Through this program LPBF has found a way of addressing the environmental needs of our community that is cost effective and incorporates additional educational components.

Finally, the Bayou St. John Comprehensive Management Plan written by LPBF in 2007 envisioned a future where, if the old water control structure at Robert E. Lee was removed, water

quality, habitat, aesthetic, and recreational enhancements would be realized. To accomplish these goals, the plan called for five benchmarks to be met:

1. Manage Bayou St. John water flow and water quality;
2. Enhance the estuarine habitat potential for fish and wildlife in and along Bayou St. John;
3. Increase and facilitate recreational access to Bayou St. John;
4. Create public awareness and educational opportunities related to the cultural and historical links between Bayou St. John and the development of New Orleans; and
5. Identify and create public awareness and educational opportunities related to bayou and estuarine ecology along Bayou St. John.

The removal of the old water control structure, improving water quality, and recent wetland restoration projects mark the beginning of the hopeful revitalization of Bayou St. John