Measurements of lateral flow from the Mississippi River at Mardi Gras Pass in the Bohemia Spillway using synoptic ADCP

A field report

Submitted to

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By

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Introduction

The Coastal Hydrodynamics and Sediment Transport Laboratory at the Pontchartrain Institute for Environmental Sciences conducted synoptic ADCP surveys at Mardi Gras Pass (MGP), which is a Pass connected to the Mississippi River near the Bohemia Spillway. The survey was conducted on June 29, 2017.

Objective

The objective of the survey was to measure the discharge (flow) at MGP to continue the construction of a stage-discharge curve, by adding a point for the high flow 2017 (Figure 1).

Methods

To measure discharge, we used a vessel-mounted Teledyne Acoustic Doppler Current Profiler (ADCP), used in tandem with a differential global positioning system (DGPS, Trimble GS232). The surveys followed a pre-determined schedule of transects, targeted to establish a flow balance within reach four of MGP. Additional synoptic ADCP measurements were conducted to establish a flow distribution within the receiving basin. The junction at MGP with the back Levee Canal (BLC) and the junction of John Bayou with the BLC were the focus of this survey.

Results

Stage Discharge ta MGP

The average flow in Mardi Gras Pass on June 29, 2017 was approximately 334.4 m^3/s or 11,810.1 cfs. Using a standard deviation derived from the field measurements, the average flow at the time of measurement was 334.4 ± 10.2 m^3/s, or 11,810.1 ± 358.6 cfs. Figure 1 shows the updated rating curve for MGP using only ADCP flow data, and Table 1 provides a summary of all flows measured in MGP from each survey conducted throughout the monitoring period.

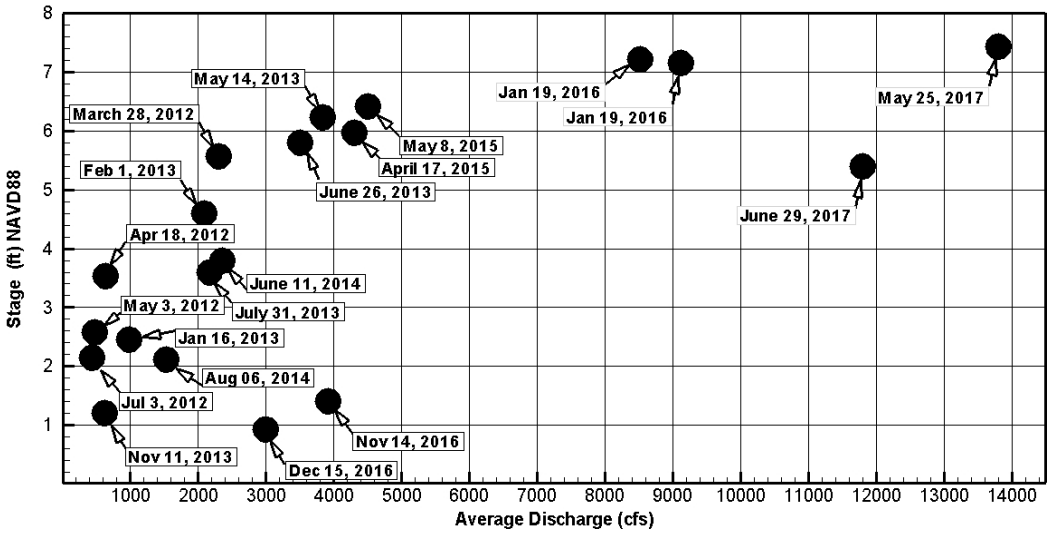


Figure 1. Evolving Stage Discharge curve for Margi Gras Pass showing all flow measurements since 2012.

Table 1. Discharge details from each survey (1-19) with statistics and corresponding River Stage (ft NAVD88) at West point a la Hache (from rivergauges.com)

Survey number	Date	Average Velocity (ft/s)	Average Discharge (cfs)	Average Discharge (cms)	Standard Deviation (cfs)	Standard Error (cfs)	Standard Deviation (cms)	Standard Error (cms)	Stage (ft) NAVD88
MGP 01	3/28/2012	4.2	2,303.0	65.2	59.4	24.3	1.7	0.7	5.6
MGP 02	4/18/2012	1.2	630.3	17.8	10.8	5.4	0.3	0.2	3.5
MGP 03	5/3/2012	0.9	479.9	13.6	23.3	10.4	0.7	0.3	2.6
MGP 04	7/3/2012	0.8	436.1	12.3	13.5	6.0	0.4	0.2	2.1
MGP 05	1/16/2013	2.0	981.9	27.8	24.7	12.4	0.7	0.3	2.5
MGP 06	2/1/2013	4.0	2,097.2	59.4	16.6	6.8	0.5	0.2	4.6
MGP 07	5/14/2013	2.9	3,840.5	108.8	194.2	97.1	5.5	2.8	6.2
MGP 08	6/23/2013		3,510.3	99.4	40.0	28.2	1.1	0.8	5.8
MGP 09	7/31/2013	2.3	2,167.2	61.4	31.0	17.8	0.9	0.5	3.6
MGP 10	11/11/2013	0.5	537.8	15.2	37.2	21.5	1.1	0.6	1.2
MGP 11	6/11/2014	1.9	2,353.6	66.6	46.2	26.7	1.3	0.8	1.2
MGP 12	8/6/2014	1.2	1,535.1	43.5	40.4	20.2	1.1	0.6	2.1
MGP 13	4/17/2015	2.9	4,300.4	121.8	115.6	81.8	3.3	2.3	6.2
MGP 14	5/8/2015	3.2	4,508.6	127.7	193.1	136.6	5.5	3.9	6.4
MGP 15	1/19/2016	5.2	9,123.1	258.3	115.7	81.8	3.3	2.3	7.2
MGP 15	1/19/2016	4.7	8,517.5	241.2	268.9	134.5	7.6	6.6	7.2
MGP 16	11/14/2016	1.7	3,925.0	111.1	52.1	30.1	1.5	1.2	1.4
MGP 17	12/15/2016	1.3	3,004.2	85.1	165.6	95.6	4.7	3.8	0.9
MGP 18	5/25/2017	5.0	13,793.6	390.6	70.9	50.2	2.0	1.4	7.4
MGP 19	6/29/2017	3.9	11,810.1	334.4	358.6	253.6	10.2	7.2	5.4

Flow Distribution in the receiving basin

The flow distribution at the time of the survey is shown in Figure 2. The surveys were completed over the course of 3 – 4 hours during which time the water surface elevation at the West Point A La Hache river station operated by the US Army Corps of Engineers was at high slack time (high slack tide prior to the ebbing tide) at the time of the survey (Figure 2) and experienced change of the order of centimeters. The flow distribution in the receiving basin is shown in Figure 3 with approximately 36% of the flow moving northwest (inland) in the BLC and the remaining 64% of the flow seaward. When this flow arrives at the junction with John Bayou, approximately 52% of the flow enters John Bayou while the remaining 48% of the flow continues in the BLC.

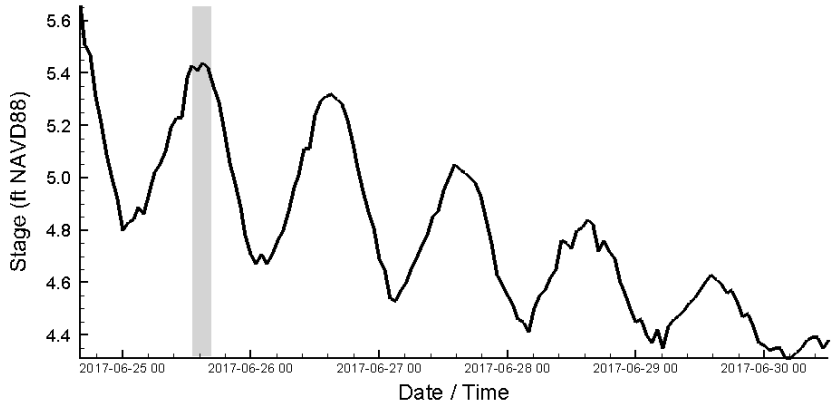


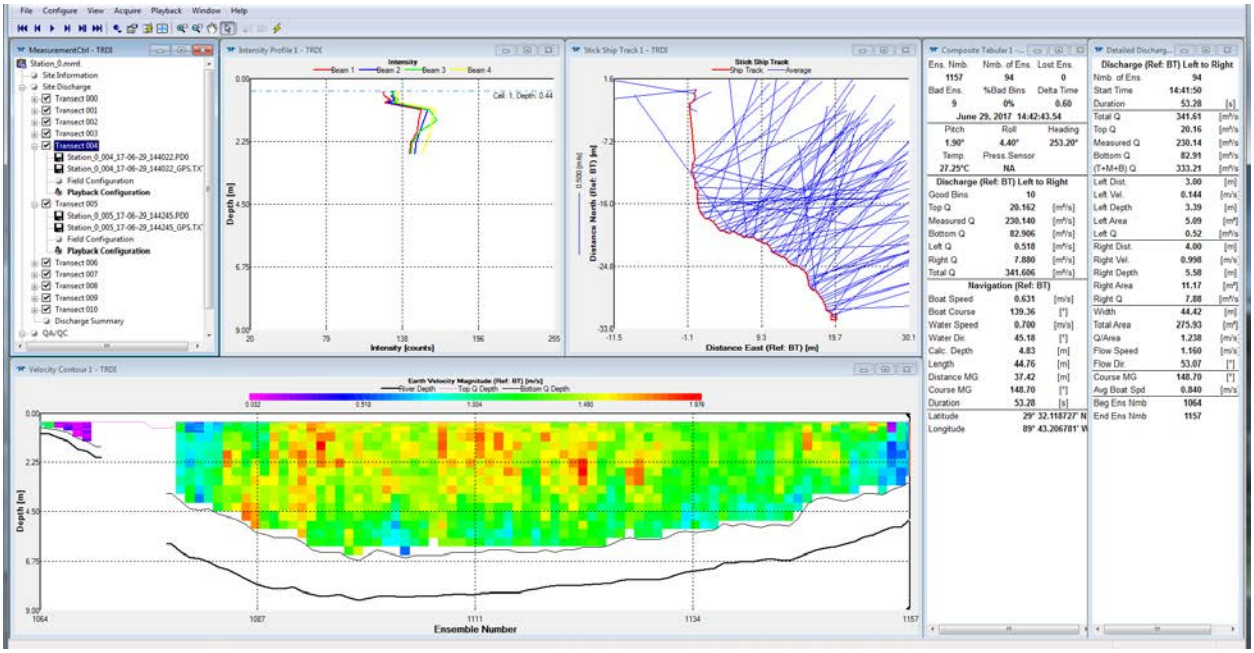
Figure 2. Stage at West Point A La Hache Evolving Stage Discharge curve for Margi Gras Pass showing all flow measurements since 2012.

Figure 3. Mardi Gras Pass flow and flow distribution in the receiving basin at key junctions in the back levee canal and John Bayou.

Appendix A. Mardi Gras Pass Survey June 29, 2017

Transect 004

Q ~ 341 m^3/s



Transect 019

Q ~ 327 m^3/s