Incipient Formation of a New Distributary Pass of the Mississippi River within the Bohemia Spillway, Southeast Louisiana

a.k.a. Mardi Gras Pass

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to
State of the Coast Conference
New Orleans, La.

Wednesday June 27, 2012
Mississippi River flood protection and “back” Levees

Mardi Gras Pass

Bohemia Spillway

Mississippi River

Breton Sound

Bayou Lamoque
Mississippi River flood protection and "back" levees

Bohemia Spillway Area

Mardi Gras Pass

Breton Sound

Bayou Lamoque

Legend
- Parish Boundaries
- USGS - Land Loss
- USACE Land Loss
- Purple: Time 5 (1990-2001)
- Purple: Time 3 (1974-1983)
- Teal: Time 2 (1958-1974)
- Blue: Time 1 (1932-1958)
- Land
- Water
October 10, 2010 overflight

Typical Bohemia Spillway
2011 Hydrologic Investigation by LPBF Bohemia Spillway Discharge 30,000 to 50,000 cfs

1. Discharge reduction on the River
2. Sum of Q along natural levee transect
3. Local Channel Flow patterns
4. Hydrodynamic Modeling
Total Spillway estimated to be 30,000 to 50,000 cfs at peak stage

Developing breach across the road as the river fell, 5,000 to 7,000 cfs estimated in July

High water surveys (LPBF & UNO) May 17 through June 7, 2011

Post-High Surveys July 10, 17, and 24, 2011 with lower water but active breach

Pre-High water LPBF survey March 3, 2011

West Pointe a la Hache Stage 2011
Normal condition, i.e. ~300 cfs discharges through metal culverts below the road through Bohemia.

Present condition (July 17, 2011), i.e. 5000 to 7000 cfs discharges through new bypass canal cut by recent high water overtopping the road through Bohemia.
PIC 3 July 10, 2011 breach in road just south (down river) of Diversion Canal, 130 feet wide, maximum water depth 20 feet, but 24 feet below road surface. Estimate of discharge 5000 to 7000 cfs
May 1, 2008

River bar with a Black willow forest 3-4 ft elevation
PIC 8 July 17, 2011 eroding forested river bar from breach near river at Diversion Canal
PIC 7 July 17, 2011 eroding forested river bar from breach near river at Diversion Canal
7-24-2011 Bohemia Spillway on east side of river bar near the breach at the diversion canal: Waterfalls are developed due to overtopping of the bar but at a lower rate so that water levels have fallen on the marsh side of the bar.
PIC 10 July 17, 2011 overflowing forested river bar near breach at Diversion Canal

Overflowing forested river bar near breach at Diversion Canal. Water depth 0.5 to 2.0 feet July 17, 2011. Eroding channel cuts into the forested bar 7-10 feet deep.
2008 CIR

December 5, 2011 To February 24, 2012

May to July 2011
Road Blowout Observations:

- May 21, 2011
  - Width = 50 ft
  - Roadtop to water surface = ~ 2 ft

- June 6, 2011
  - Width = 130 ft
  - Roadtop to water surface = 4.5 ft

Legend:

- 2-to 10 feet deeper
- 24 feet deeper
- 5 to 10 feet deeper
- Approximate Flow Channel

Water Depth (ft):
- 5 - 7
- 8 - 9
- 10 - 11
- 12 - 13
- 14 - 15
- 16 - 17
- 18 - 19
School of pogy fish migrating and feeding in channel
Mardi Gras Pass March 10, 2012

5 ft water depth or -2.5 ft elevation 3/10/2012
10 feet water depth or -8 ft elevation 4/23/2012
~38 ft wide

Survey water level 2.6 feet NAVD 1988
Mississippi River at Pointe a la Hache 2.48 ft
2011
2012

Road Elevation

Minimum Bar Elevation

Carrollton Stage
Point a la Hache Stage
ADCP Discharge (CFS)
Headward Cutting into Bar
Overtop Elevation

Tides Mid Day (Ft above MSL)
3/10/2012 = 1.5 (High Tide)
3/28/2012 = -0.5 (Low, Rising)
4/18/2012= 1.2 (High, Falling)
5/3/2012 = 1.75 (High Tide)

-7 Thalweg Elevation bar center on 3/10

Headward Erosion Across River Bar (Ft.)
2011

Road Elevation

Minimum Bar Elevation

2012

-7 Thalweg Elevation bar center on 3/10

Elevation

River Stage (Ft.)

Carrollton Stage

Point a la Hache Stage

ADCP Discharge (CFS)

Headward Cutting into Bar

Overtop Elevation

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Headward Erosion Across River Bar (Ft.)

J F M A M J J A S O N D J F M A M
Mardi Gras Pass surveys 2012  DRAFT  do not circulate

Measuring Vel. reach 1 @ river bank 1.4 ft/sec ext  Q 100 to 200 cfs

ADCP 1
3/28  
2,400 cfs

ADCP 2
4/18  
626 cfs

ADCP 3
5/3  
475 cfs

March 10 Reach 1 @ river
was 32' X 5' max, i.e. CSA ~ 130 sq ft

June 20 Reach 1 @ river
was 43' X 10-12 at bank, i.e. CSA ~ 400 sq ft

Stage Hydrograph
Mississippi River At West Pointe A La Hache, LA
Mardi Gras Pass Discharge Estimate:
Low water 500 to 1,000 cfs
High water 3,000 to 6,000 cfs
Mardi Gras Pass: Interpolated Depths
May 18, 2012

Bathymetric Survey Completed
May 18, 2012.

Using Trimble RTK GPS
with Sonarmite Fathometer.

Depth surface interpolated from bathymetric points
using Spatial Analysis Toolbox in ArcGIS 10.0.

Approximate River Stage at
West Pointe a la Hache During Survey:
3.3 ft

Approximate Tidal Stage at
Shell Beach During Survey:
1.2 ft

Legend
Interpolated Depth (ft)

- 25.021
- 23.1172
- 21.2134
- 19.3096
- 17.4058
- 15.502
- 13.5982
- 11.6945
- 9.79066
- 7.88687
- 5.98307
- 4.07928
- 2.17549

2008 IR DOQQ Imagery provided by La. DOTD,
CRS: NAD_1983_UTM_Zone_16N

Downed trees blocking Reach 1

Trees previously along the riverbank that have fallen into river.
### Table 1: Summary statistics by Reach for the transects and polygons used to assess the width and depth of Mardi Gras Pass for the April and May surveys (2012)

<table>
<thead>
<tr>
<th>Reach</th>
<th>Number of Width Transects</th>
<th>Average Width (ft)</th>
<th>Minimum Width (ft)</th>
<th>Maximum Width (ft)</th>
<th>Number of Depth Polygons</th>
<th>Average Depth (ft) (*)</th>
<th>Minimum Depth (ft) (*)</th>
<th>Maximum Depth (ft) (*)</th>
<th>Average Thalweg depth (ft)</th>
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</thead>
<tbody>
<tr>
<td>1 – 4</td>
<td>50</td>
<td>77.5</td>
<td>43.0</td>
<td>167.0</td>
<td>139</td>
<td>10.1</td>
<td>4.3</td>
<td>23.7</td>
<td>13.2</td>
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<tr>
<td>1</td>
<td>5</td>
<td>56.2</td>
<td>43.0</td>
<td>76.0</td>
<td>11 (**)</td>
<td>7.9</td>
<td>4.3</td>
<td>14.0</td>
<td>9.1</td>
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<tr>
<td>2</td>
<td>6</td>
<td>98.7</td>
<td>79.0</td>
<td>142.0</td>
<td>17</td>
<td>11.6</td>
<td>8.2</td>
<td>18.3</td>
<td>16.0</td>
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<tr>
<td>3</td>
<td>6</td>
<td>90.3</td>
<td>71.0</td>
<td>119.0</td>
<td>17</td>
<td>9.7</td>
<td>7.8</td>
<td>12.1</td>
<td>13.9</td>
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<tr>
<td>4</td>
<td>33</td>
<td>74.5</td>
<td>58.0</td>
<td>167.0</td>
<td>92</td>
<td>10.3</td>
<td>6.7</td>
<td>23.7</td>
<td>13.3</td>
</tr>
</tbody>
</table>
Mardi Gras Pass:
Reach 1, June 20 2012

Legend
- MGPass_BankSurvey_Jun20012
- MGPass_BankSurvey_May302012
- MardiGrasPass_May302012

Dept_Adj
- 1.517000 - 2.545182
- 2.545183 - 3.573364
- 3.573365 - 4.601545
- 4.601546 - 5.629727
- 5.629728 - 6.657909
- 6.657910 - 7.686091
- 7.686092 - 8.714273
- 8.714274 - 9.742455
- 9.742456 - 10.770636
- 10.770637 - 11.798818
- 11.798819 - 12.827000

2008 IR DOQQ Imagery provided by La. DOTD,
CRS: NAD_1983_UTM_Zone_18N

0 40 80 160 Feet

Draft -- Not For Distribution
Mardi Gras Pass

Mardi Gras Pass

Louisiana Department of Natural Resources
Mardi Gras Pass
Lower Breton Diversion
50,000 cfs Draft SMP $220 M

Bohemia Mississippi River Reintroduction
10,000 cfs CWPPRA PPL 17 $10-
Pending state Permit to repair the road, which would close off or restrict Mardi Gras Pass flow

Lower Breton Diversion 50,000 cfs Draft SMP $220 M

Mardi Gras Pass
Roadway
Sundown/Eland Potash Oil and Gas Field Facility
Emerging Riverine Ecology in Mardi Gras Pass

Documented Species:
- Pogy
- Blue Catfish
- Grass shrimp
- River shrimp
- Spotted gar
- Needle fish
- Crawfish
- River otter
- Beaver
- Heron
- Deer
Note the striking contrast from the sterile appearance of an engineered conveyance and the natural channel of Mardi Gras Pass.
Significance of Mardi Gras Pass Distributary To Coastal Restoration

1) It exemplifies the local dynamic processes and forces of the Mississippi River

2) It is a rare modern example of the river re-establishing a connection to adjacent wetlands without being an engineered diversion project

3) It indicates ongoing changes in the dynamics of the lower Mississippi River

4) Mardi Gras Pass could evolve into a managed diversion that could replace one or two nearby diversion projects, such as the Lower Breton Diversion within the State’s draft Master Plan.