



LOUISIANA BARRIER ISLAND COMPREHENSIVE MONITORING PROGRAM (BICM) Volume 1: Barrier Shoreline Post-Storm Assessment

Part 5: 2006/2007 Aerial Video Survey

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of Engineers®**

Louisiana Barrier Island Comprehensive Monitoring Program (BICM)

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Introduction

The Louisiana Department of Natural Resources Office of Coastal Restoration and Management (LDNR) has implemented a Barrier Island Comprehensive Monitoring (BICM) Data Collection Program with science support from the Pontchartrain Institute for Environmental Sciences (PIES) at the University of New Orleans (UNO). UNO collected and analyzed data to facilitate the LDNR/Coastal Restoration Division (CRD) activities of barrier shoreline planning, design, maintenance, monitoring, and storm impact assessment. The baseline data collection effort and data delivery necessary to establish and develop the LDNR BICM program will provide invaluable information for future efforts involving restoration along Louisiana's sandy shorelines. The effects of the 2005 Hurricane season in Louisiana and subsequent development of integrated hurricane protection and coastal restoration planning programs make this an appropriate time to collect the baseline data necessary for understanding the past and planning for the future.

The Barrier Shoreline Post Storm Assessment consists of 5 Parts:

- Part 1: 2005 Post Hurricanes Katrina and Rita Photography
- Part 2: 2006/2007 Aerial Survey Photography
- Part 3: 2005 – 2006/2007 Photo-Pairs
- Part 4: Historic Photo-Pairs/Time Series
- Part 5: 2006/2007 Aerial Video Survey

Funding for the acquisition of 2006/2007 photography was provided by LCA Science & Technology Program, a partnership between the LDNR and the US Army Corps of Engineers (USACE), through LDNR Interagency Agreement No. 2512-06-06.

Part 5 includes:

- 1) Report
 - a. location diagrams for the 2006/2007 aerial video imagery created by Media Mapper software using USGS digital topos as background (figures 14-32)
 - b. Water level data for time of acquisition

- 2) 18 DVDs including:
 - a. 2006/2007 digital video imagery linked to GPS data.
 - b. 2006/2007 still photography linked to GPS data and annotated on the bottom of the image with GPS data
- 3) CD containing Report file in Word and pdf

Project Location

The LDNR BICM Program encompasses the mainland shoreline of the south Louisiana coast with special emphasis on the sandy beaches and barrier islands. Louisiana's mainland shoreline stretches 450 miles east from Sabine Pass on the Texas/Louisiana Border to the Pearl River on the Mississippi/Louisiana. Between Texas and Mississippi, Louisiana encompasses four distinct geologic regions: 1) Chenier Plain, 2) Acadiana Bays, 3) Mississippi River Delta Plain, and 4) the Pontchartrain Basin (Figure 1).

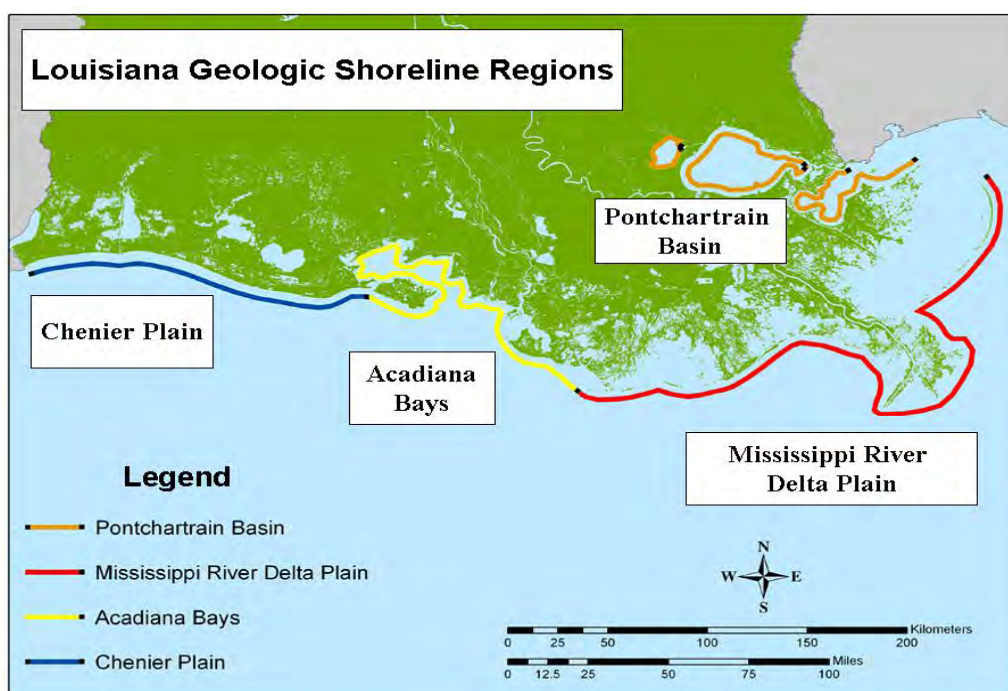


Figure 1. Louisiana's Geologic Shoreline Regions.

BICM further divided the coastline into eight regions: Western Chenier Plain, Eastern Chenier Plain, Acadiana Bays, Teche Delta, Lafourche Delta, Modern Delta, Chandeleur Islands, and the Lakes Region (Figure 2).

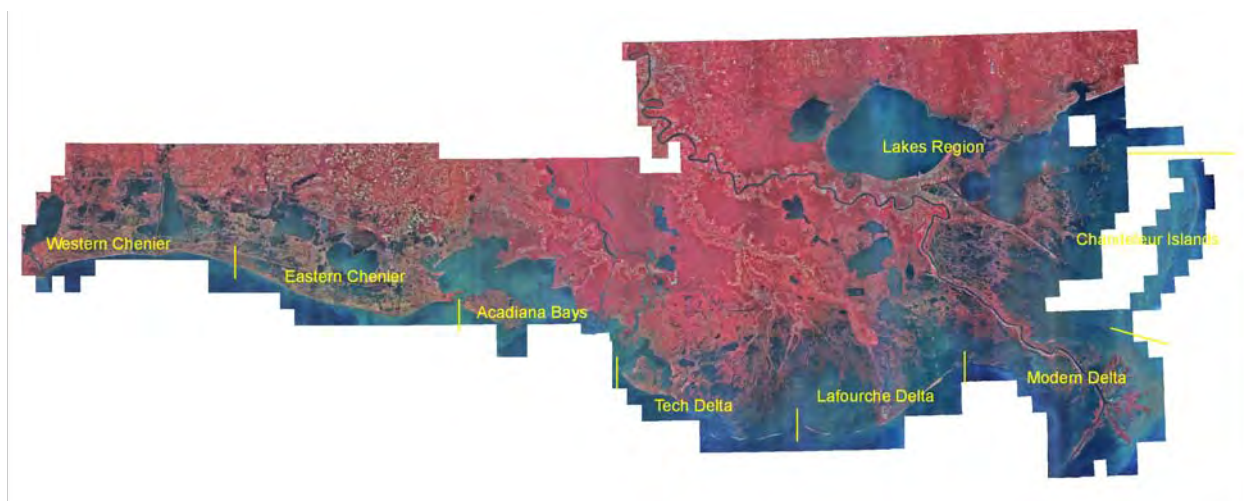


Figure 2. BICM divides coastal Louisiana into eight regions.

This effort documented shoreline conditions of the project area through oblique aerial photography including a longshore aerial video survey. The LSU Aerial Video Survey has been acquiring video and still oblique imagery of the Louisiana coastline since 1984, and maintains an extensive archive. The surveys have become routine, and numerous locations along the Louisiana shoreline have been photographed in a comparable fashion over many years, facilitating a visual illustration of shoreline and habitat change over time. The oblique aerial video is acquired with GPS data linked to the video image for determining the approximate location of all imagery.

Methodology

2006/2007 Aerial Video Survey – data acquisition

The most recent, previous LSU aerial video imagery was acquired in 2001. Any type of documentation along the Louisiana coast is quickly made obsolete by hurricanes, restoration projects and general landscape evolution in the rapidly changing Louisiana coastal zone. Updated imagery is critical for resource management, restoration efforts and hurricane impact assessment, recovery efforts and fortification planning. Imagery is valuable for a variety of purposes, not all of them intended at the time the imagery is acquired.

Continuous, oblique, aerial video imagery and digital still photography of the project area were acquired simultaneously from a helicopter as part of the Aerial Video Survey of Coastal Louisiana. Along the Gulf shoreline, the helicopter traveled from west to east from Sabine Pass to the Mississippi River Delta, and then south to north along the Chandeleur Islands. The bays and lakes were recorded by keeping the undulating shoreline on the left side of the helicopter. The altitude was usually 200-300 ft other than at the end of islands where the altitude was increased to 700 feet or more for a longshore view. The ground speed varied depending on the character of the shoreline and the altitude but averaged

around 55 miles per hour. The imagery includes the nearshore water to the horizon for visual reference and to include interrelationships of contiguous habitats and topography.

Dual video acquisition systems employed simultaneously provided duplication of data, dual formats for multiple uses, and as a data back-up system. Realtime GPS data was integrated with the video imagery with both methods of acquisition: digitally by the Red Hen System as a data-stream on audio channel 1 of the mini-digital-video (DV) tapes, and analog as a text overlay on the bottom of the image of the SVHS videotape. The SVHS videotapes were archived as back-up and were not needed in this project.

The Canon XL-2 digital video camera was supported by a counter-weighted, spring-loaded camera mount to minimize vibration and movement, and to prevent the camera operator from becoming fatigued (Figure 3). Still photos were taken by a Canon PowerShot S3 IS digital camera (see Part 2). Both video and still photography cameras were operated on the left side of the helicopter for images roughly perpendicular (minus 90°) to the track of the helicopter. Image stabilization technology was utilized to provide a smoother image, and the audio from the helicopter intercom was recorded to provide other observed information during flight.



Figure 3. The video camera was attached to a spring-loaded, counter-weighted support on the left side of the helicopter.

The 2006/2007 weather was an uncooperative and frustrating factor in data acquisition. The fall season between October and November is usually an ideal time for coastal imagery with regular, predictable cold fronts that remove the usual Louisiana high-humidity haze and provide crisp atmospheric conditions for clean, clear images of the land/water interface with increased clarity of cooler water. However, this season was an exception, with very

few cloud-free days that coincided with possible field efforts. Three attempts were made to acquire data, and each attempt provided only partial success. The final data was acquired in April 2007. The 2006/2007 aerial video survey generated 18 DV cassettes that each held a maximum of 60 minutes of digital video imagery. The survey was flown starting from Sabine Pass and flying to the west to follow the shoreline.

The dates and areas of acquisition were:

November 20, 2006 –

Western Chenier Plain – Sabine Pass (11:49:49 CST) to Mud Lake Outlet (12:45:32 CST)

Eastern Chenier Plain – Mud Lake Outlet (14:49:37 CST) to Southwest Pass (16:11:11 CST)

Acadiana Bays – Gulfside of Marsh Island (16:10:59 CST – 16:34:52 CST)

November 21, 2006 –

Acadiana Bays - Bayside Marsh Island (10:06:26 CST) to Point au Fer Island (15:29:09 CST)

Teche Delta –

Point au Fer (15:27:17-15:29:09, 15:30:12 CST) to Caillou Boca (16:08:31 CST)

April 20, 2007 –

Teche Delta -Raccoon Island of the Isles Dernieres (9:18:05 CDT) to Wine Island (10:02:46 CST)

Lafourche Delta – Timbalier Island (10:06:40 CDT) to East Grand Terre Island (12:03:31 CDT)

Modern Delta – Cheniere Ronquille (12:06:59 CDT) to Sandy Point (12:43:19 CDT)

Sandy Point Bay (12:43:19 CDT) to Pass a Loutre (14:09:59 CDT)

April 21, 2007 –

Modern Delta - Pass a Loutre (09:10:00 CDT) to Deepwater Point (09:42:42 CDT),
Chandeleur Islands (10:15:53 – 11:18:23 CDT)

Lakes Region

Lake Borgne from Isle au Pitre (11:35:54 CDT) to the Rigolets (14:27:43 CDT)

Rigolets, Lake Borgne (14:27:43 CDT) to Lake Pontchartrain (14:34:15 CDT)

Lake Pontchartrain from the Rigolets (14:35:14 CDT) to the 17th Street Canal (15:06:49 CDT);

April 22, 2007 –

Lakes Region –

South Lake Pontchartrain from West End (8:08:23 CDT) to Pass Manchac (08:45:16 CDT),

Lake Maurepas (08:44:44 – 09:39:09 CDT),

North Lake Pontchartrain from Pass Manchac (09:38:44 CDT) to the Rigolets (11:26:21 CDT),

Rigolets from Lake Pontchartrain (11:25:55 CDT) to Lake Borgne (11:33:46 CDT)

Lake Borgne from the Rigolets (11:33:46 CDT) to the Pearl River (11:41:26 CDT).

Post-processing

The Red Hen System, Inc was the only off-the-shelf technology available at the time for linking GPS data with digital video, and did not work with HD video. During post-processing, the associated Media Mapper software created an index layer within a GIS layered format from the GPS data stream encoded on audio channel 1. A geo-referenced red dot was placed on the index layer for each GPS coordinate recorded by the Red Hen System. The GPS coordinates were recorded every two seconds, so that the placement of each dot generated a red line to represent the flight line of the imagery. This index layer, represented on figures by the flight line, was used to link video imagery, photographic images, time series and other layers in an Arc GIS platform.

The 2006/2007 aerial video survey generated 18 DV cassettes that each held a maximum of 60 minutes of digital video imagery. Each DV cassette was imported to a computer through iMovie to archive the digital video (DV), label and edit the footage, and to create a Spatial DVD (sDVD). Both the DV and the sDVD act as backup files that include the audio track containing the encoded Red Hen GPS data. The sDVDs were imported into Media Mapper to generate the flight path and set up Media Maps based on the eight BICM regions. A “Media Map” is the designation for the software work-space that contains a selected grouping of files. Figures 4-11 indicate the video coverage for each of the eight BICM regions. The background image was taken from the 2001 Louisiana Oil Spill Research and Development Program image. The red line represents the flight line generated from the GPS data acquired during the survey.



Figure 4. Western Chenier Plain on DVD01: Gulf shoreline from Sabine Pass to the Mud Lake Outlet.

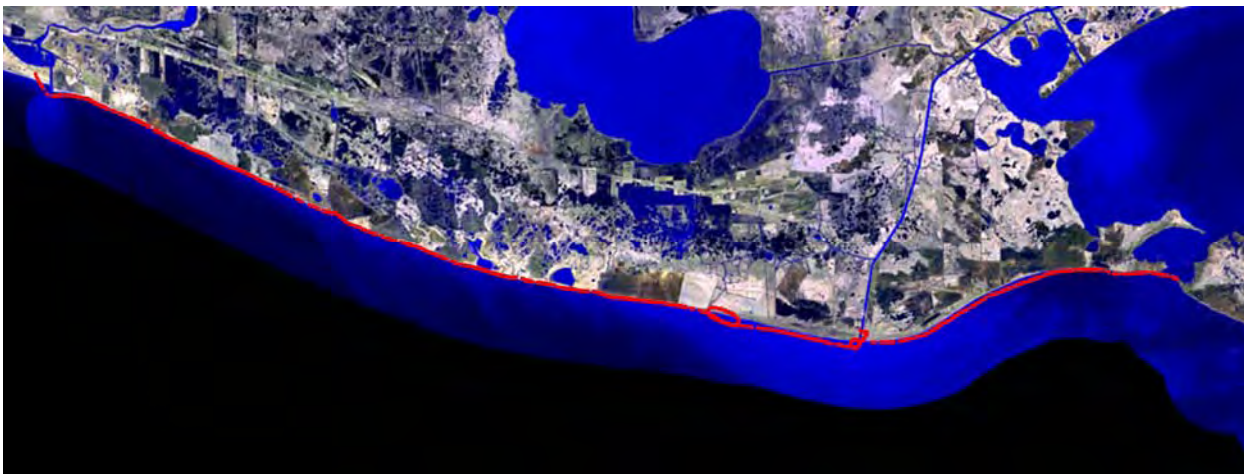


Figure 5. Eastern Chenier Plain is on DVD02: Gulf shoreline from Mud Lake Outlet to the Southeast Pass.



Figure 6. Acadiana Bays is on DVD03-DVD07: Gulf and bay shoreline of Marsh Island, Vermilion Bay, East and West Cote Blanche bays, Wax Lake Delta, Atchafalaya Delta, and Pt au Fer Island.



Figure 7. Teche Delta is on DVD08-DVD09: Gulf shoreline of Point au Fer Island to Caillou Boca, Isles Dernieres.

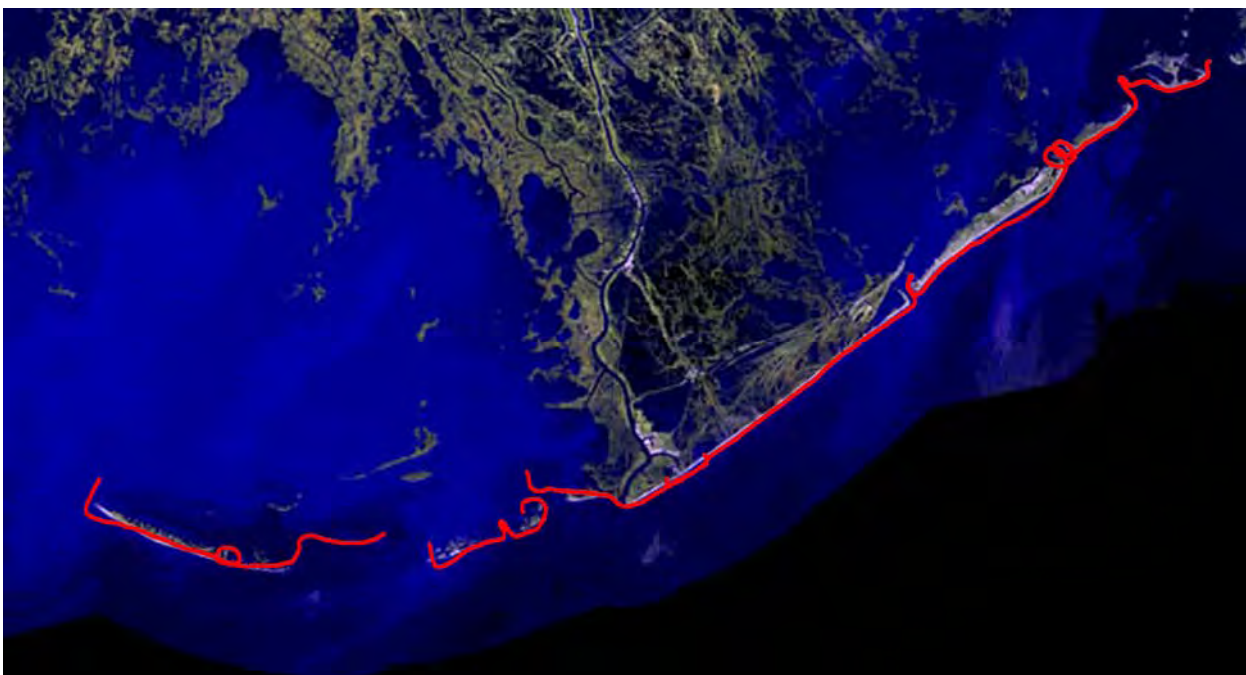


Figure 8. Lafourche Delta is on DVD10: Timbalier Island to East Grand Terre Island.

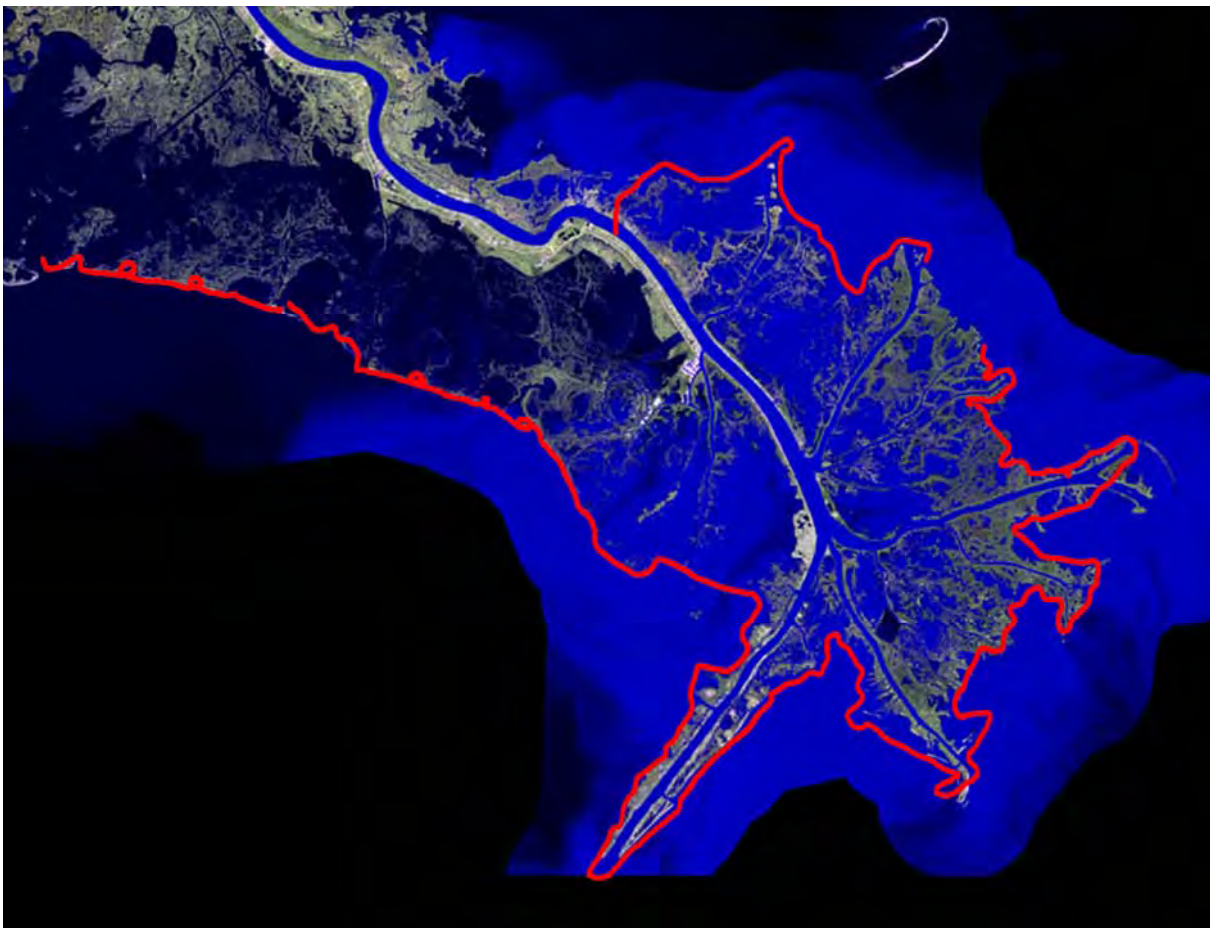


Figure 9. Modern Delta is on DVD11-DVD12: Plaquemines shoreline Quatre Bayou Pass to Sandy Point; Mississippi River Delta from Sandy Point Bay to Deepwater Point.

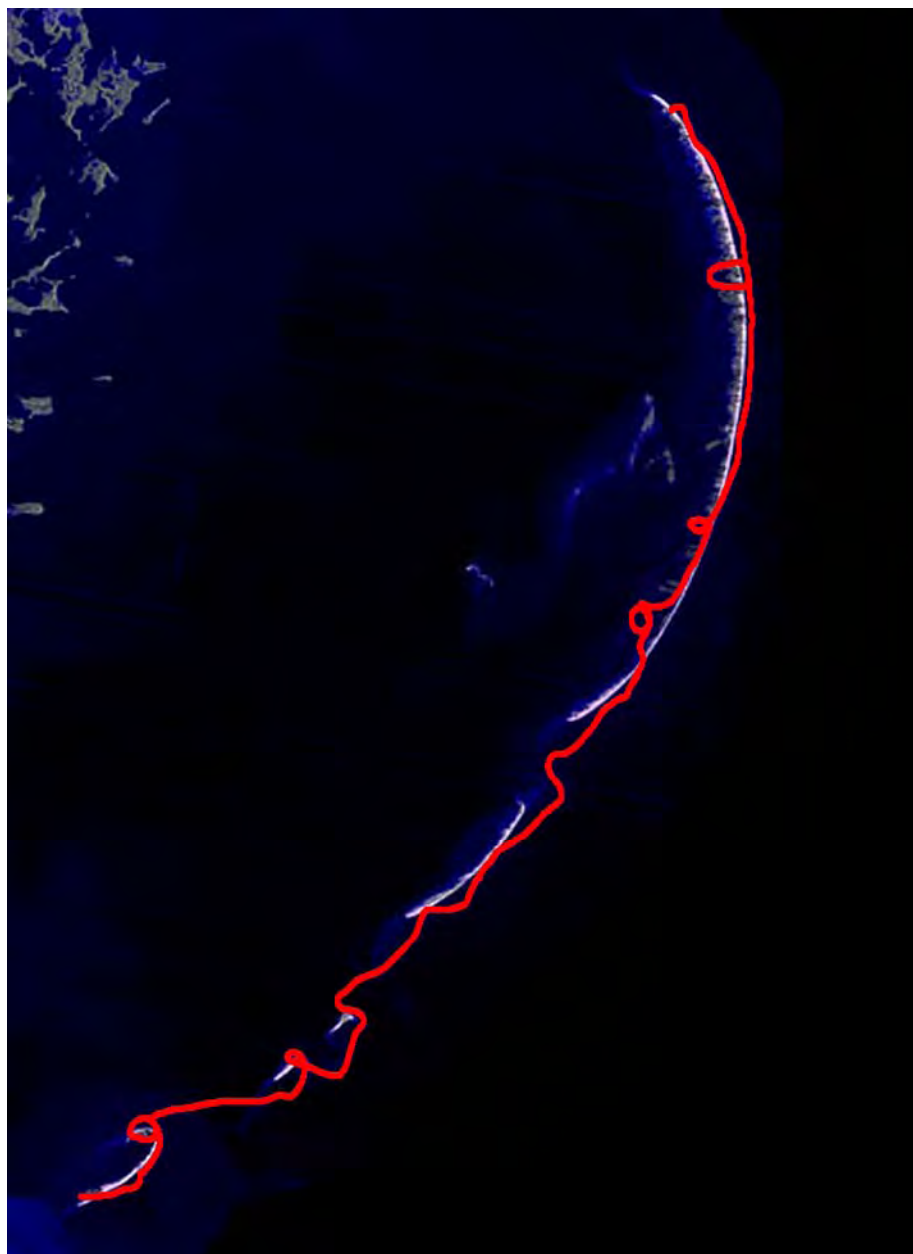


Figure 10. Chandeleur Islands are on DVD13: Breton Island to Hewes Point.



Figure 11. Lakes Region is on DVD14-DVD18: Lake Borgne, Lake Pontchartrain and Lake Maurepas.

MediaMapper provided Digital Orthophoto Quadrangles (DOQs) and Digital Raster Graphics (DRGs) (black & white aerial photography) at various resolutions to use as backdrops for the flight path. This helps locate specific features and points of interest on the video. For the previous figures, a satellite image was used for the larger scale coverage instead of the cluttered topographic maps to help highlight the red line.

Once the video was imported from the original sDVD and linked to the flight path, the BICM segments were determined by the information on the background topographic map. Labels were added to the appropriate video imagery on the stored DV files in iMovie along with any place names from the background topo maps or other resources. A second sDVD was then created and imported to replace the original video so that the imagery displayed by the Media Map contained place names and BICM segment designations (Figure 12). Chapter markers were inserted at BICM segment divisions and at various locations that can be scrolled with the “next” button.

The still photography that coincided with the DV was also imported into the Media Map and was linked to the flight path by calibrating the camera time code with that of the video index layer. The location of each photograph is designated by a blue triangle that is shown on top of the red flight line in the Media Map. Although other layers were added to the Media Map as feature layers for the other subtasks to help manually locate photo-pairs, 2005 photography and time series, these are not available as html.



Figure 12. An example of the label added to the video imagery to indicate place name and BICM segment designation. Chapter markers are set to help scroll through the imagery.

Water level

Table 1 lists the mean range, spring range, and mean tide level for various stations along the Louisiana coastline and is modified from the NOAA website:

<http://tidesandcurrents.noaa.gov/tides07/tab2ec4.html#108>

Table 1. Mean range, spring range and mean tide levels in feet for tide gages along the Louisiana coast. Many of the listed stations are no longer active.

Station	Latitude	Longitude	Mean Range (ft)	Spring Range (ft)	Mean Tide Level (ft)
Bayou BonFouca, Route 433	30° 16.3'	89° 47.6'	0.53	0.53	0.26
Tchefuncta River, Lake Pontchartrain	30° 22.7'	90° 09.6'	0.57	0.57	0.28
New Canal USCG station, Lake Pontchartrain	30° 01.6'	90° 06.8'	0.51	0.52	0.26
Chef Menteur, Chef Menteur Pass	30° 03.9'	89° 48.0'	0.97	1.06	0.56
Michoud Substation, ICWW	30° 00.4'	89° 56.2'	1.23	1.39	0.70
Shell Beach, Lake Borgne	29° 52.1'	89° 40.4'	1.28	1.41	0.72
Grand Pass	30° 07.6'	89° 13.3'	1.14	1.47	0.73
Chandeleur Light	30° 03'	88° 52'	--	1.2	0.6
Comfort Island	29° 49.4'	89° 16.2'	1.45	1.57	0.80

Bay Gardene	29° 35.9' 89° 37.1'	1.34	1.44	0.75
Breton Islands	29° 29.6' 89° 10.4'	1.37	1.37	0.69
Jack Bay	29° 22.0' 89° 20.7'	--	1.2	0.6
Grand Bay	29° 23.1' 89° 22.8'	1.25	1.34	0.67
Lonesome Bayou (Thomasin)	29° 14' 89° 03'	--	1.1	0.5
Mississippi River				
North Pass, Pass a Loutre	29° 12.3' 89° 02.2'	1.08	1.10	0.55
Southeast Pass	29° 07.0' 89° 02.7'	--	1.2	0.6
SOUTH PASS	28° 59.4' 89° 08.4'	1.18	1.22	0.61
Port Eads, South Pass	29° 00.9' 89° 09.6'	--	1.1	0.5
Southwest Pass	28° 55.9' 89° 25.7'	--	1.3	0.6
Joseph Bayou	29° 03.5' 89° 16.3'	--	1.4	0.7
Paris Road Bridge	30° 00' 89° 56'	--	1.1	0.6
Empire Jetty	29° 15.0' 89° 36.5'	--	1.3	0.7
Bastian Island	29° 17.2' 89° 39.8'	--	1.2	0.6
Quatre Bayous Pass	29° 18.6' 89° 51.2'	--	1.3	0.6
Barataria Pass	29° 16' 89° 57'	--	1.2	0.6
Barataria Bay				
EAST POINT, GRAND ISLE	29° 15.8' 89° 57.4'	1.04	1.06	0.53
Bayou Rigaud, Grand Isle	29° 16' 89° 58'	--	1.0	0.5
Independence Island	29° 18.6' 89° 56.3'	--	0.9	0.4
Manilla	29° 25.6' 89° 58.6'	--	1.0	0.5
Caminada Pass (bridge)	29° 12.6' 90° 02.4'	0.99	0.99	0.50
Timbalier Island, Timbalier Bay	29° 05' 90° 32'	--	1.2	0.6
Pelican Islands, Timbalier Bay	29° 07.7' 90° 25.4'	--	1.2	0.6
Wine Island, Terrebonne Bay	29° 04.7' 90° 37.1'	--	1.3	0.6
Cocodrie, Terrebonne Bay	29° 14.7' 90° 39.7'	1.01	1.05	0.53
Caillou Boca	29° 03.8' 90° 48.4'	--	1.4	0.7
Raccoon Point, Caillou Bay	29° 03.5' 90° 57.7'	--	1.7	0.8
Ship Shoal Light	28° 55' 91° 04'	--	1.6	0.8
Atchafalaya Bay				
Eugene Island	29° 22' 91° 23'	--	1.9	1.0
Point Au Fer	29° 20' 91° 21'	--	2.0	1.0
Shell Island	29° 28' 91° 18'	--	1.5	0.7
Point Chevreuil	29° 31' 91° 33'	--	1.5	0.8
Rabbit Island, 5 miles south of	29° 25' 91° 36'	--	2.0	1.0
South Point, Marsh Island	29° 29' 91° 46'	--	1.8	0.9
Lighthouse Point	29° 31' 92° 03'	--	2.0	1.0
Cote Blanche Island, West Cote Blanche Bay	29° 44' 91° 43'	--	1.4	0.7
Southwest Pass, Vermilion Bay	29° 35' 92° 02'	--	1.6	0.8
Weeks Bay, Vermilion Bay	29° 48' 91° 50'	--	1.5	0.7
Mermentau River entrance	29° 45' 93° 06'	--	2.5	1.2
Calcasieu Pass, Lighthouse wharf	29° 47' 93° 21'	--	2.0	1.0

Tide level data were obtained from (NOAA at <http://tidesandcurrents.noaa.gov/> . The data varied between every 6 minutes, every hour or monthly, with more detailed data available for more recent dates. Few of the stations in the previous list provided data along the coast for the time periods needed, and some of these had limited data for limited periods of time. The stations used are highlighted in red on the list. The stations used for tide level data were as follows:

Sabine Pass North #8778094;
Calcasieu Pass, East Jetty #8768094;
 Tesoro Marine Terminal (Morgan City, Atchafalaya River) #8764044
Grand Isle, East Point #8761724;
Pilots Station East, Southwest Pass #8760922;
 Gulfport Harbor #8745557; and
New Canal Station (South shore of Lake Pontchartrain) #8761927

Figures 13-19 are graphs of the predicted (blue line) and observed (red line) tide levels during photo acquisition (NOAA at <http://tidesandcurrents.noaa.gov/>.) The data obtained showed that the waterlevels during the November flight of western Louisiana and the Acadiana Bays were roughly a foot below normal, while the April water levels for south eastern, eastern and the Lakes Region were very close to normal or slightly (a few inches) above that predicted.

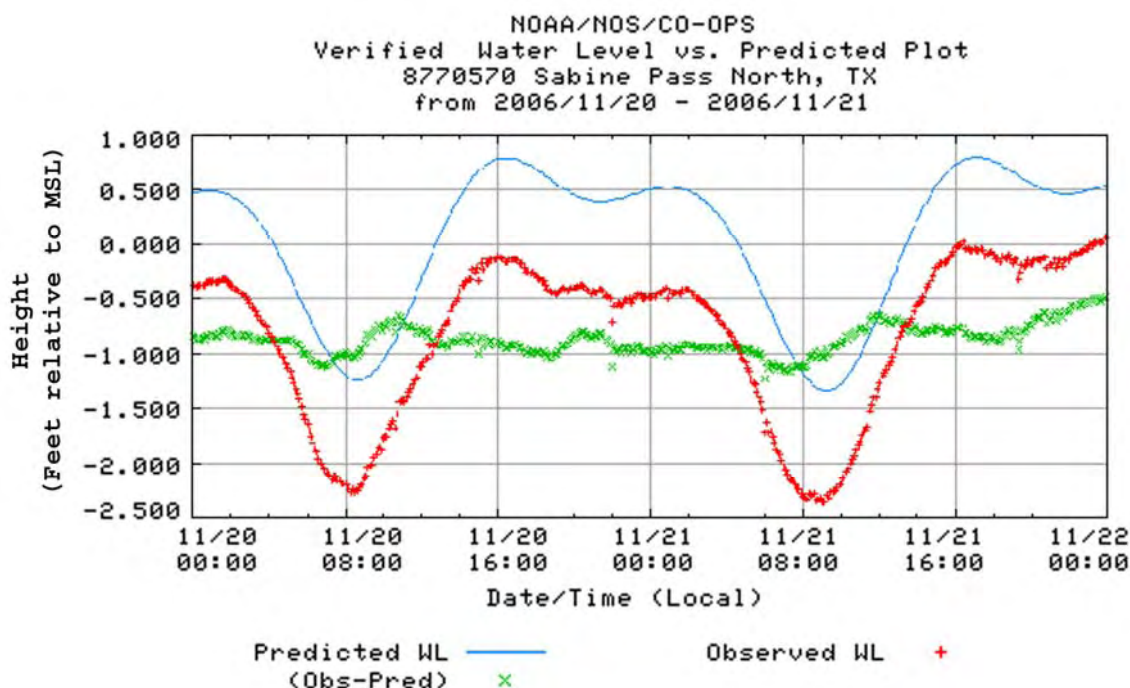


Figure 13. Graph of the tide levels at Sabine Pass North for November 20-21, 2006 during photo acquisition on 11/20 for western Louisiana. This shows that the water levels were roughly a foot lower than predicted for the vicinity of BICM regions Western and Eastern Chenier Plain.

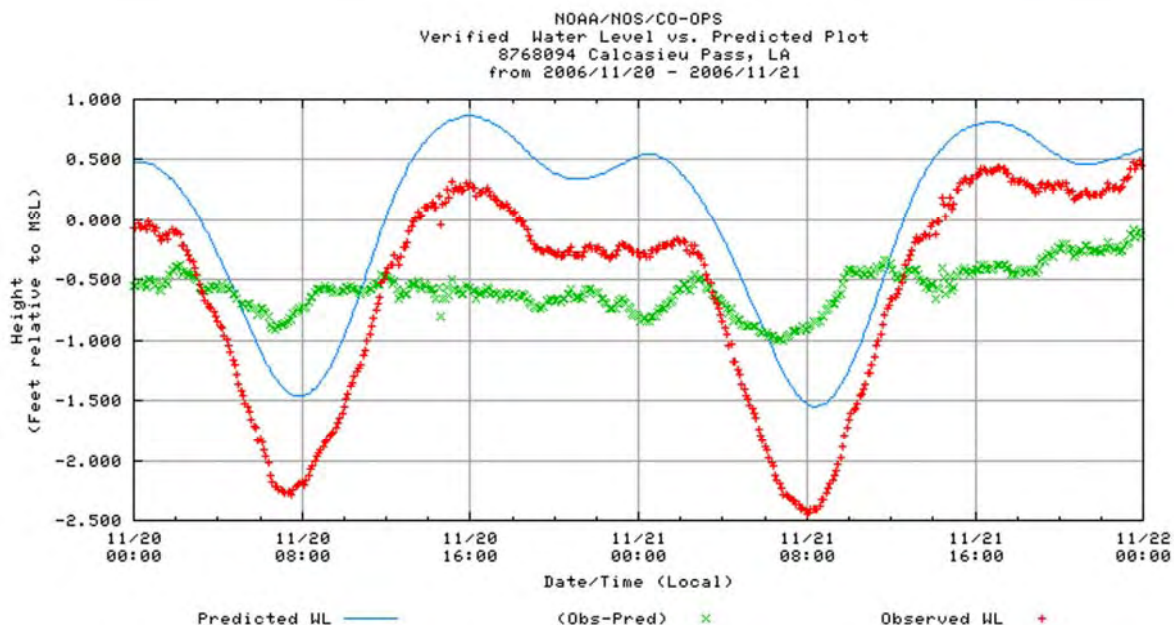


Figure 14. Graph of the tide levels at Calcasieu Pass for November 20-21, 2006 during photo acquisition on 11/20 for western Louisiana. This shows that the water levels were roughly a half a foot lower than predicted for the vicinity of BICM regions Western and Eastern Chenier Plain.

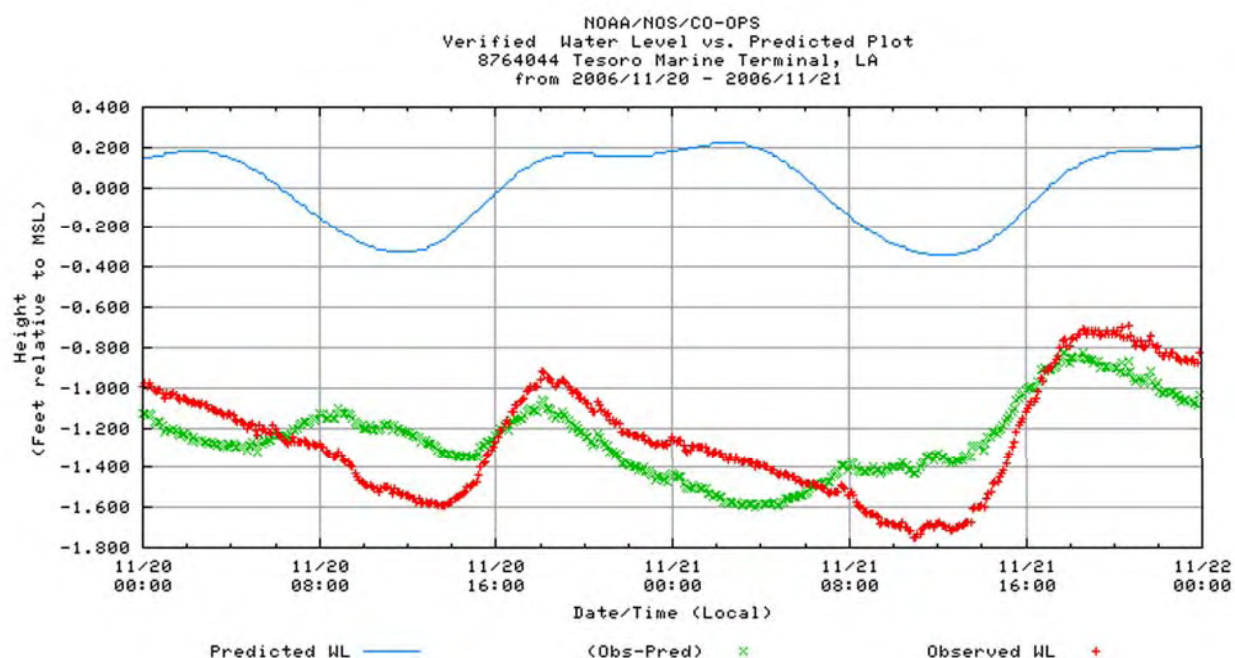


Figure 15. Graph of the tide levels at Morgan City on the Atchafalaya River for November 20-21, 2006 during photo acquisition on 11/21 for south central Louisiana. This shows that the water levels were roughly a foot lower than predicted for the vicinity of BICM region Acadiana Bays.

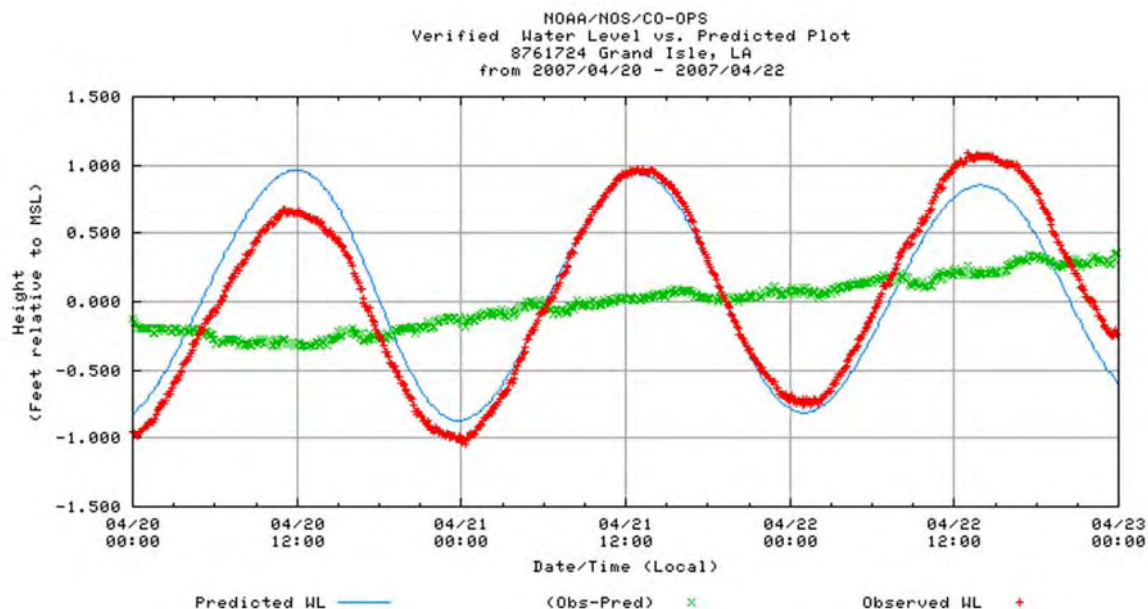


Figure 16. Graph of the tide levels at Grand Isle East Point, LA for April 20-22, 2007 during photo acquisition on 4/20 for south eastern Louisiana. This shows that the observed water levels were normal and close to those predicted for the vicinity of BICM regions Teche Delta and Lafourche Delta.

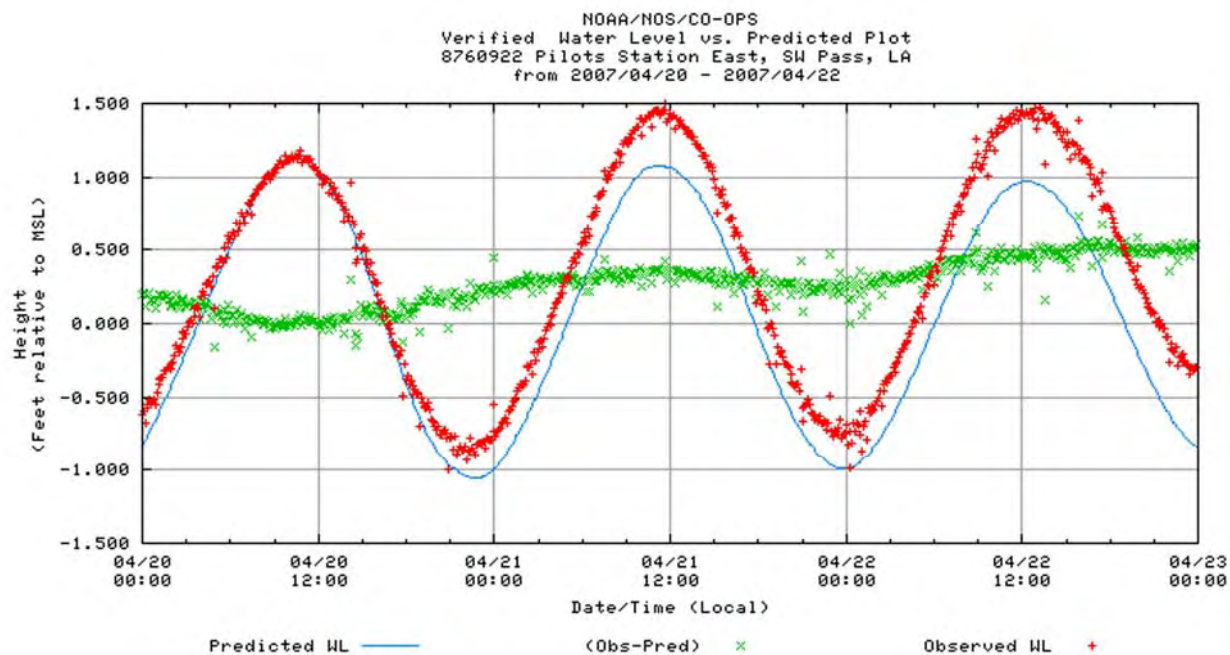


Figure 17. Graph of the tide levels at the mouth of Southwest Pass, LA for April 20-22, 2007 during photo acquisition on 4/20-21 for south eastern Louisiana. This shows that the observed water levels were normal and close to those predicted for the vicinity of BICM region Modern Delta.

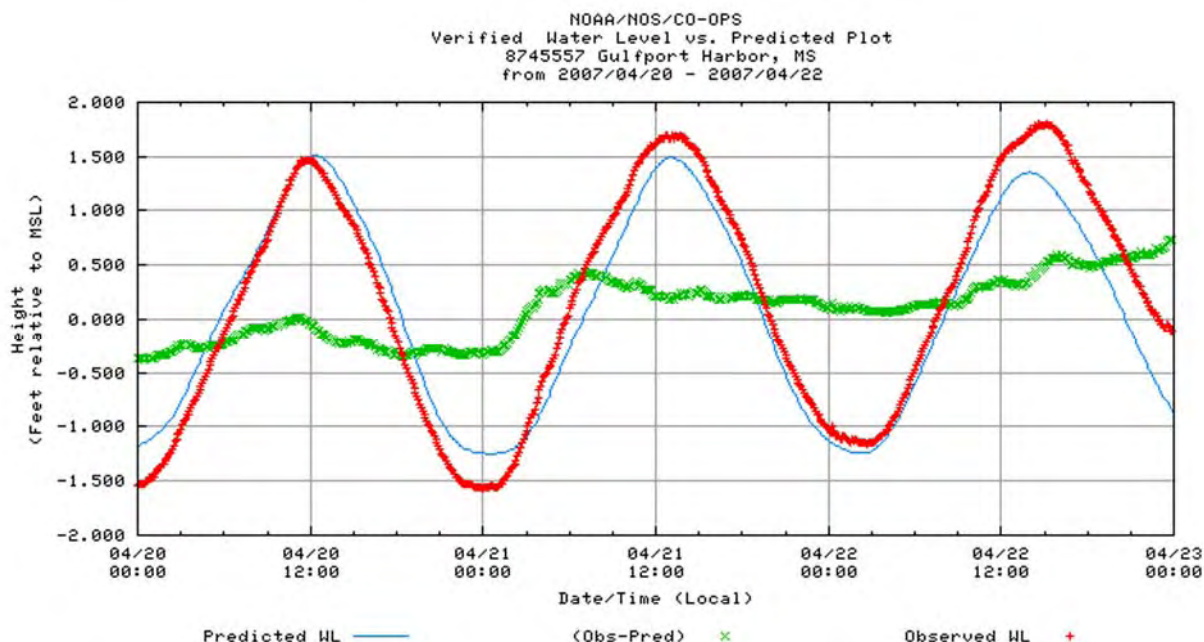


Figure 18. Graph of the tide levels at Gulfport, MS for April 20-22, 2007 during photo acquisition on 4/21 for eastern Louisiana. This shows that the observed water levels were normal and close to those predicted for the vicinity of BICM region Chandeleur Islands.

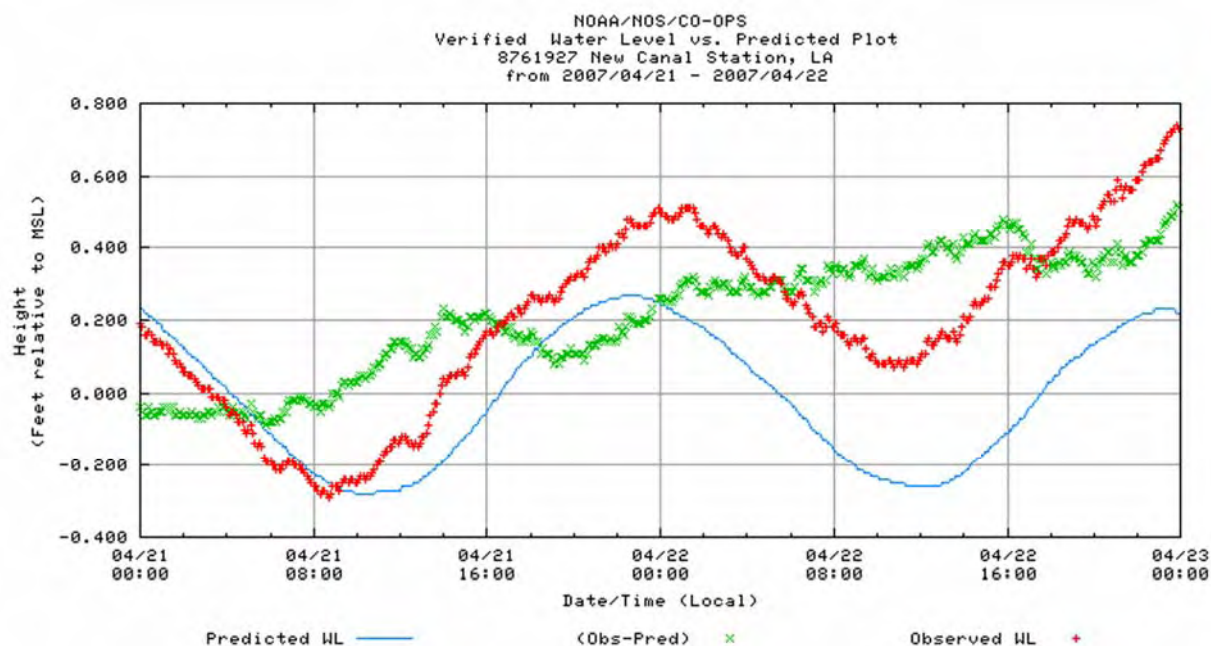


Figure 19. Graph of the tide levels at New Canal at the south shore of Lake Pontchartrain, LA for April 20-22, 2007 during photo acquisition on 4/21-22 for Lake Pontchartrain. This shows that the observed water levels were increasing during the day but still close to those predicted for the vicinity of BICM Lakes Region.

Deliverables

Once compilation of all media and layers was complete, the “map” could be exported in several ways, including:

1. **HTML** allows export of the map with digital media as a main HTML page along with any view objects as linked HTML files.
2. **Shapefiles** creates map layers for use in Environmental Systems Research Institute (ESRI) products or other software that uses Shapefiles.
3. **Media Map** packages a copy of an entire media map, including the layers and any associated multimedia files such as captured images, video clips, or sound files to transfer fully functional media maps to a CD or DVD. The exported media map is in MediaMapper format and can only be opened in MediaMapper.

For this project, the HTML export was used to create the deliverable DVDs, since the data could fit comfortably on 4.7GB DVDs. Shapefiles and Media Map exports created files too large to be transferred other than by an external harddrive.

Part 5 includes:

- 4) Report
 - a. location diagrams for the 2006/2007 aerial video imagery created by Media Mapper software using USGS digital topos as background (figures 14-32)
 - b. Water level data for time of acquisition
- 5) 18 DVDs including:
 - a. 2006/2007 digital video imagery linked to GPS data.
 - b. 2006/2007 still photography linked to GPS data and annotated on the bottom of the image with GPS data
- 6) CD containing Report file in Word and pdf

The 18 DVDs are listed below and are shown in Figure 20.

- 1) AVS2006 DV01 – Sabine Pass to Mud Lake Outlet
- 2) AVS2006 DV02 – Mud Lake Outlet to Southwest Pass
- 3) AVS2006 DV03 – Gulf shoreline of Marsh Island
- 4) AVS2006 DV04 – Bay shoreline of Marsh Island and West Vermilion Bay
- 5) AVS2006 DV05 – Little Vermilion Bay to Red Bluff
- 6) AVS2006 DV06 – Cote Blanche Bays and Wax Lake Delta
- 7) AVS2006 DV07 – Atchafalaya Delta to Point au Fer
- 8) AVS2006 DV08 – Point au Fer to Caillou Boca
- 9) AVS2007 DV09 – Isles Dernieres
- 10) AVS2007 DV10 – Timbalier Island to East Grand Terre Island
- 11) AVS2007 DV11 – Quatre Bayou Pass to Sandy Point and West Mississippi River Delta
- 12) AVS2007 DV12 – East Mississippi River Delta
- 13) AVS2007 DV13 – Chandeleur Islands
- 14) AVS2007 DV14 – East & South Lake Borgne

- 15) AVS2007 DV15 – North Lake Borgne & the Rigolets
- 16) AVS2007 DV16 – South Lake Pontchartrain
- 17) AVS2007 DV17 – Lake Maurepas including Pass Manchac
- 18) AVS2007 DV18 – North Lake Pontchartrain Pass Manchac to the Rigolets

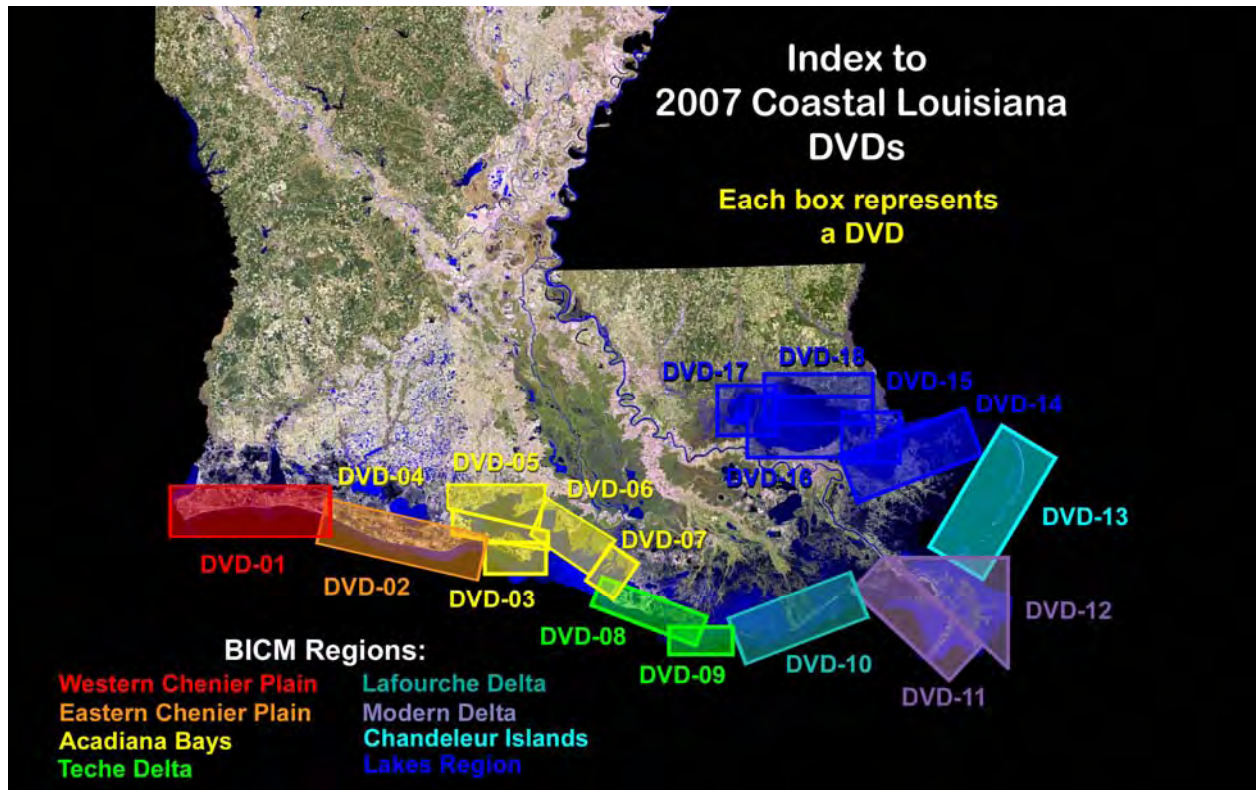


Figure 20. The 18 digital video tapes were edited, split and combined according to BICM region and segments, and the file size that would fit onto the output DVDs.

DVD Instructions

The DVDs include both video and still photography that were taken simultaneously. Both are linked to GPS location data.

The 18 DVDs contains two folders, one of which is the folder containing the video imagery, and the second with a file extension of “html,” that contains the indexing system and any additional media. To access the linked imagery, “index.html” in the “AVS ~ _html” folder must be opened in a browser. These DVDs may not work on an Apple platform, and should be used in Windows for the linking software to work.

It may take a few moments for the file to load, and you may need to allow blocked items to be viewed on your computer. When the file opens, it generates a home page that that shows a map with flight line on the right, and a directory layer on the left (Figure 21). The video imagery is accessed at the top of the directory, and the still photography is accessed from the thumbnail list below the video link. A blue symbol represents the location of each image on the flight line shown to the right. Hovering over any photograph causes an arrow to appear on the map to the right showing where that photo is located. Clicking on the map where there is a blue symbol will open a page containing that photograph. The photographs are full-size files, so will appear large. Scrolling to the bottom of the image will provide the annotated location data generated for that image.

Clicking on the video link will open a new page (again you may have to allow blocked content), with a video screen on the top left and the map to the right (Figure 22). GPS data will load in the table below the video, and will change as the video moves along the flight line. The location of the video image is indicated on the map by a symbol (block “x”) that moves as the video is played, and clicking anywhere on the flight path causes the symbol and video imagery to jump to that location.

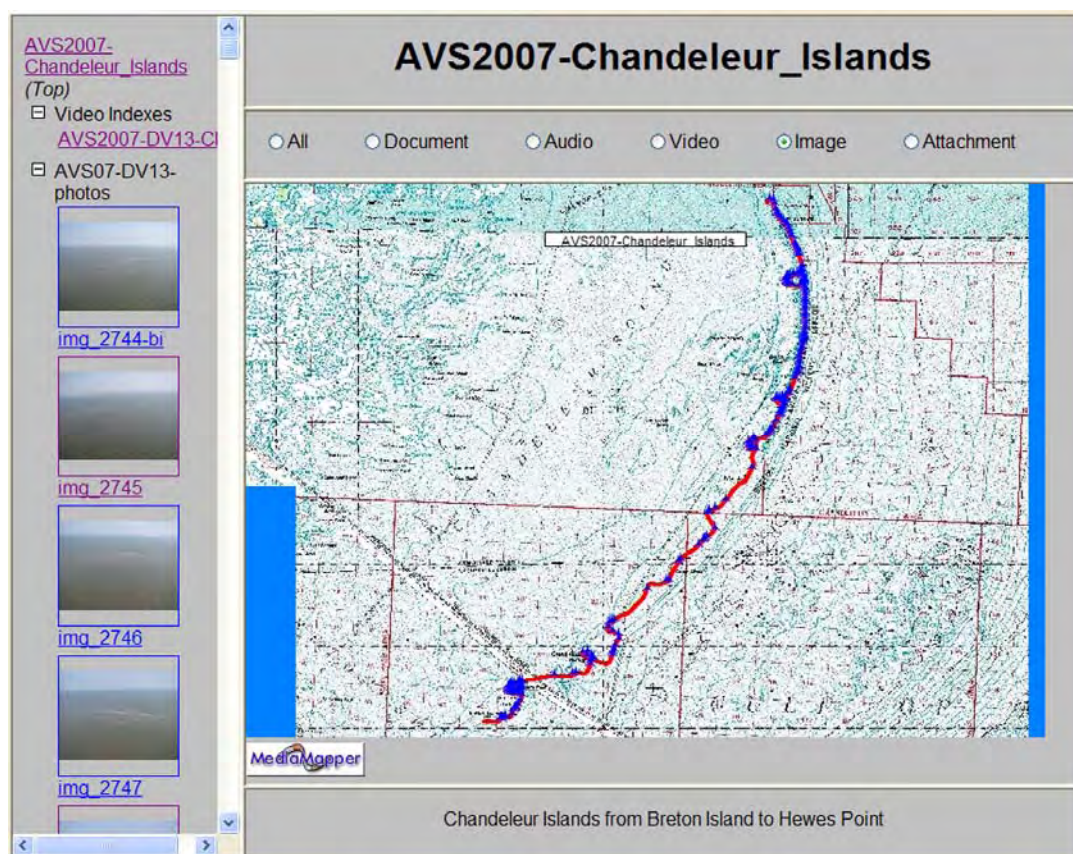


Figure 21. The home page of the html interface for linking media to the flight line. Hovering over any photo thumbnail generates an arrow to the location on the map.

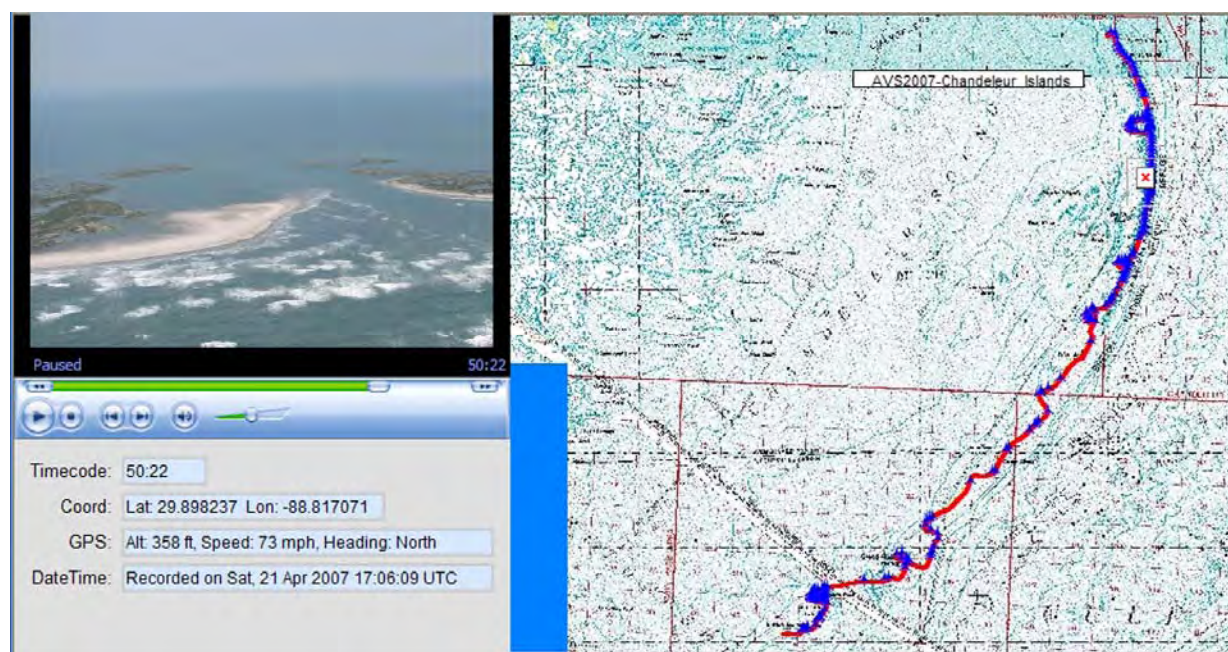


Figure 22. The html video interface shows the video and GPS data on the left, and the map with an "x" indicator for the location of the current image.

Location Diagrams for the 2006/2007 Aerial Survey Video

BICM divides coastal Louisiana into eight regions (Figure 2):

- Western Chenier Plain
- Eastern Chenier Plain
- Acadiana Bays
- Teche Delta
- Lafourche Delta
- Modern Delta
- Chandeleur Islands
- Lakes Region

The large files generated by video data were broken into sections that could be stored on a 4.7 GB DVD. Some regions required more than one DVD.

The flight line was generated by Media Mapper software by the placement of a red dot for each GPS coordinate recorded by the Red Hen System. Data points collected every 2 minutes created what appears as a line at a normal viewing scale. Gaps in the line are caused by lack of GPS data - not always a lack of video coverage. Figures 23-40 show the flight line for each of the 18 DVDs.

Western Chenier Plain



Figure 23. Location of the 2006 digital video imagery on DVD-01, taken November 20, 2006 along the Western Chenier Plain BICM region from Sabine Pass to Mud Lake Outlet, Louisiana. The direction of travel was from west to east.

Eastern Chenier Plain

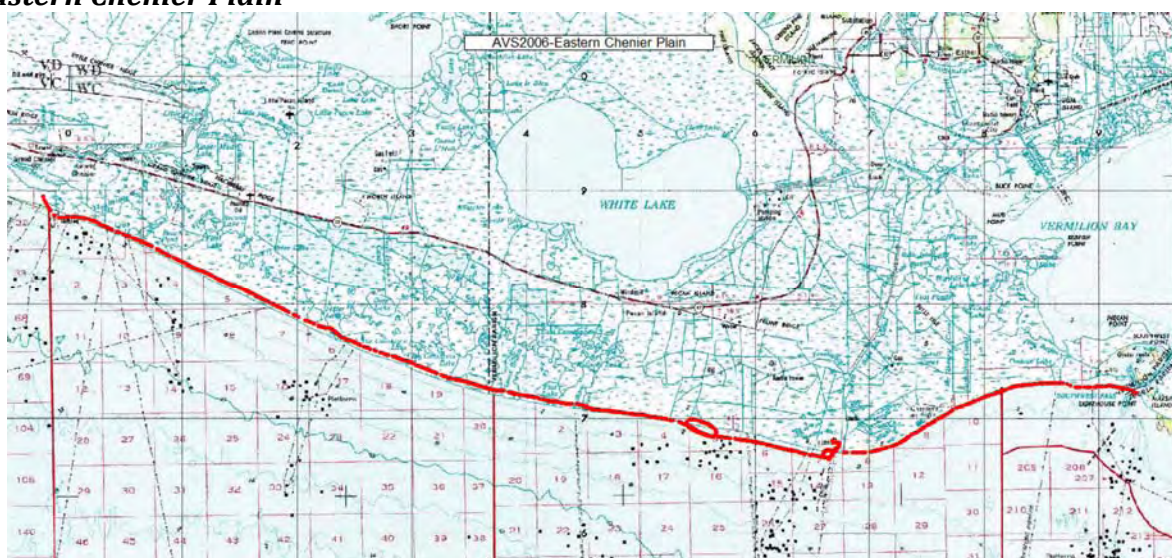


Figure 24. Location of the 2006 digital video imagery on DVD-02, taken November 20, 2006 along the Eastern Chenier Plain BICM region from Mud Lake Outlet to Southwest Pass, Louisiana. The direction of travel was from west to east.

Acadiana Bays

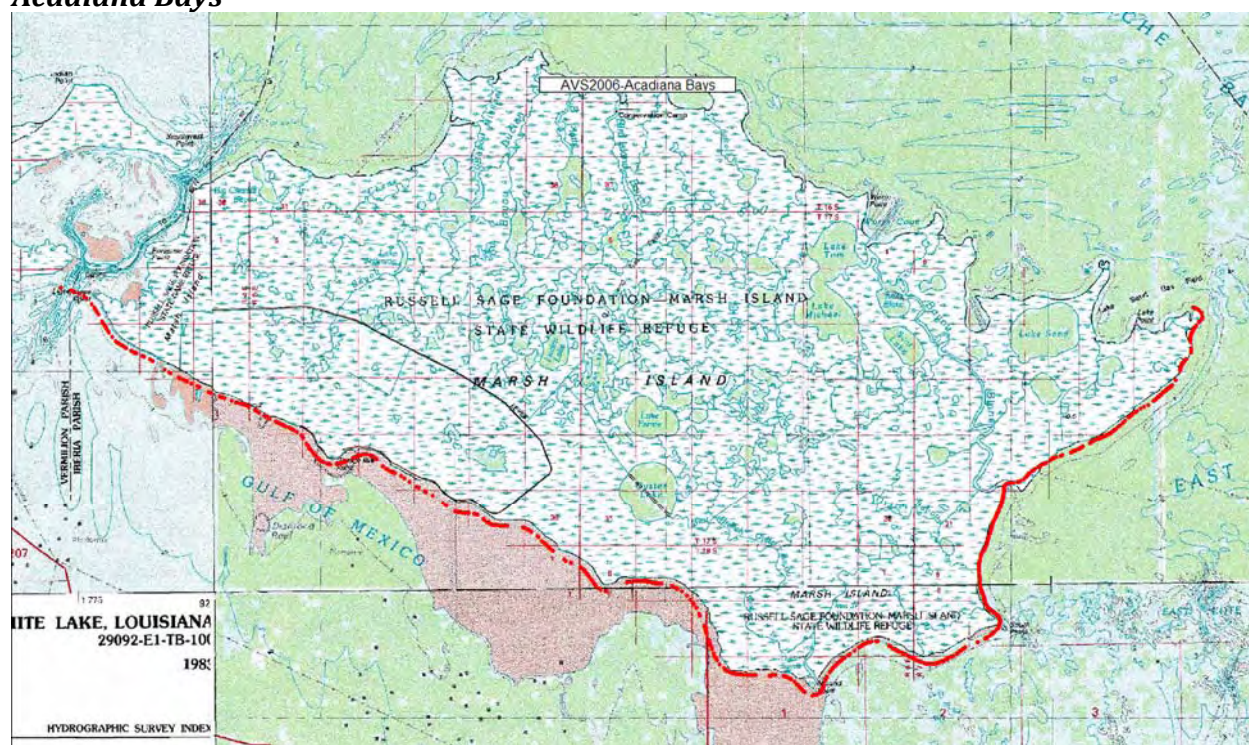


Figure 25. Location of the 2006 digital video imagery on DVD-03 taken November 20, 2006 in the Acadiana Bays along the gulf shoreline of Marsh Island, Louisiana. The direction of travel is to the east.

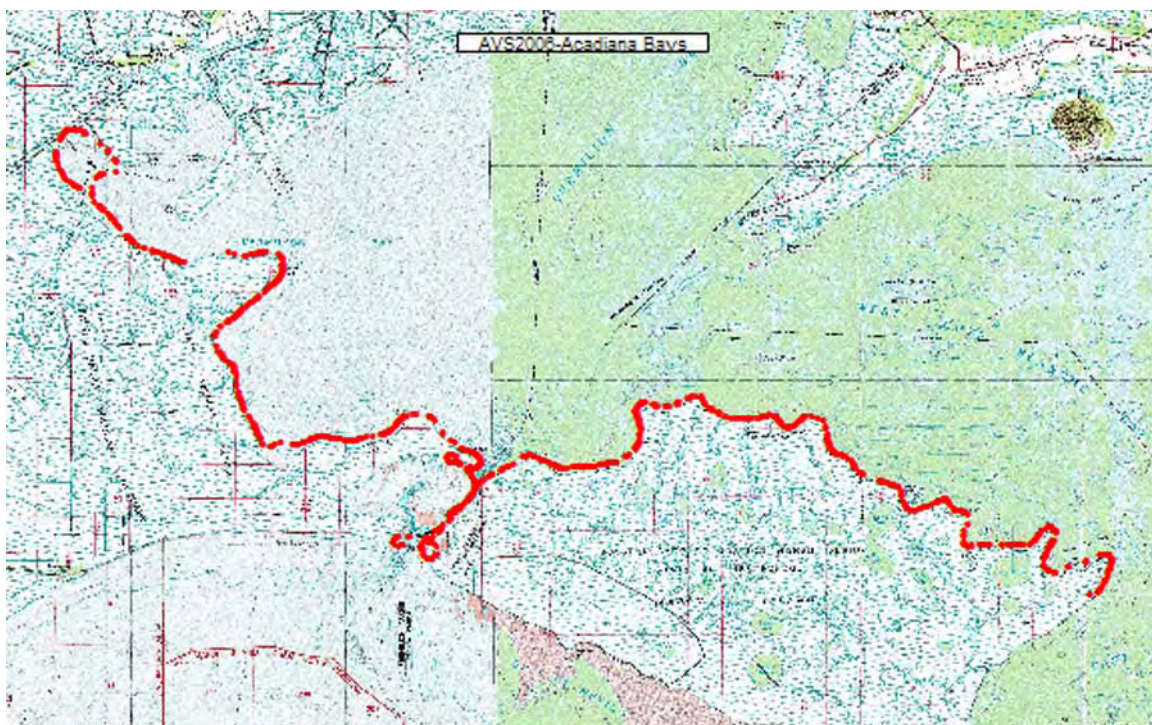


Figure 26. Location of the 2006 digital video imagery on DVD-04 taken November 20, 2006 along the Acadiana Bays shoreline from the northeast point of Marsh Island to Little Vermilion Bay, Louisiana. The direction of travel was generally to the west.

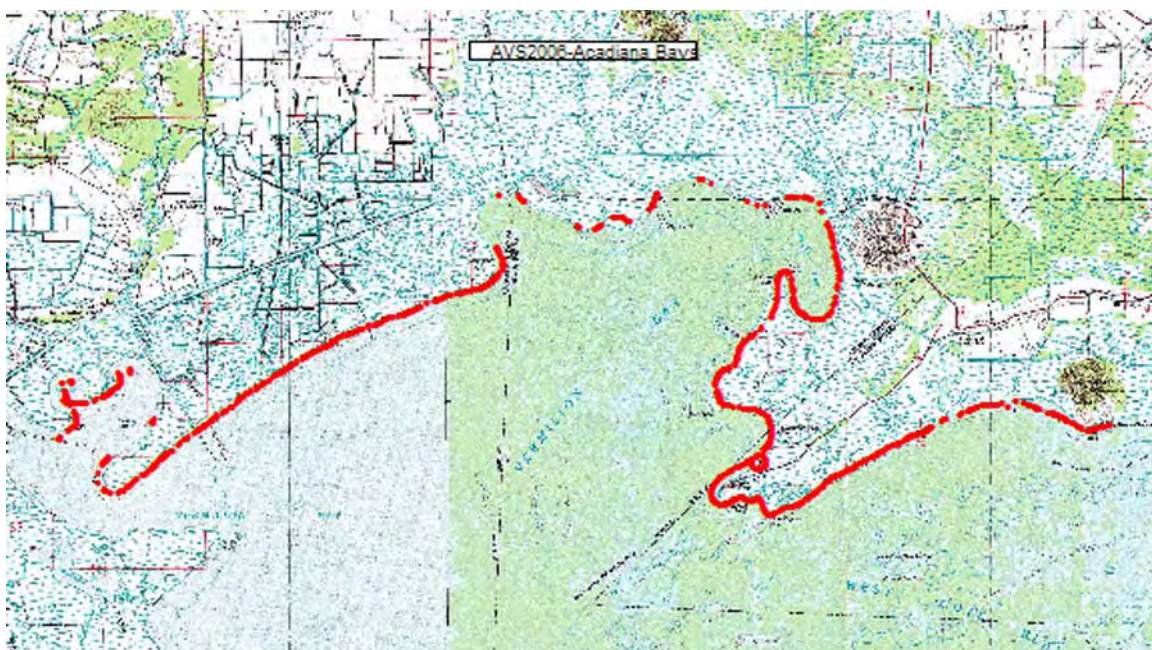


Figure 27. Location of the 2006 digital video imagery on DVD-05 taken November 20, 2006 along the Acadiana Bays shoreline from Little Vermilion Bay to Red Bluff, Louisiana. Gaps in the flight line are caused by lack of GPS satellites producing recordable data points. Photos taken in these areas could not be automatically linked by the Media Mapper software. The direction of travel was generally to the east.

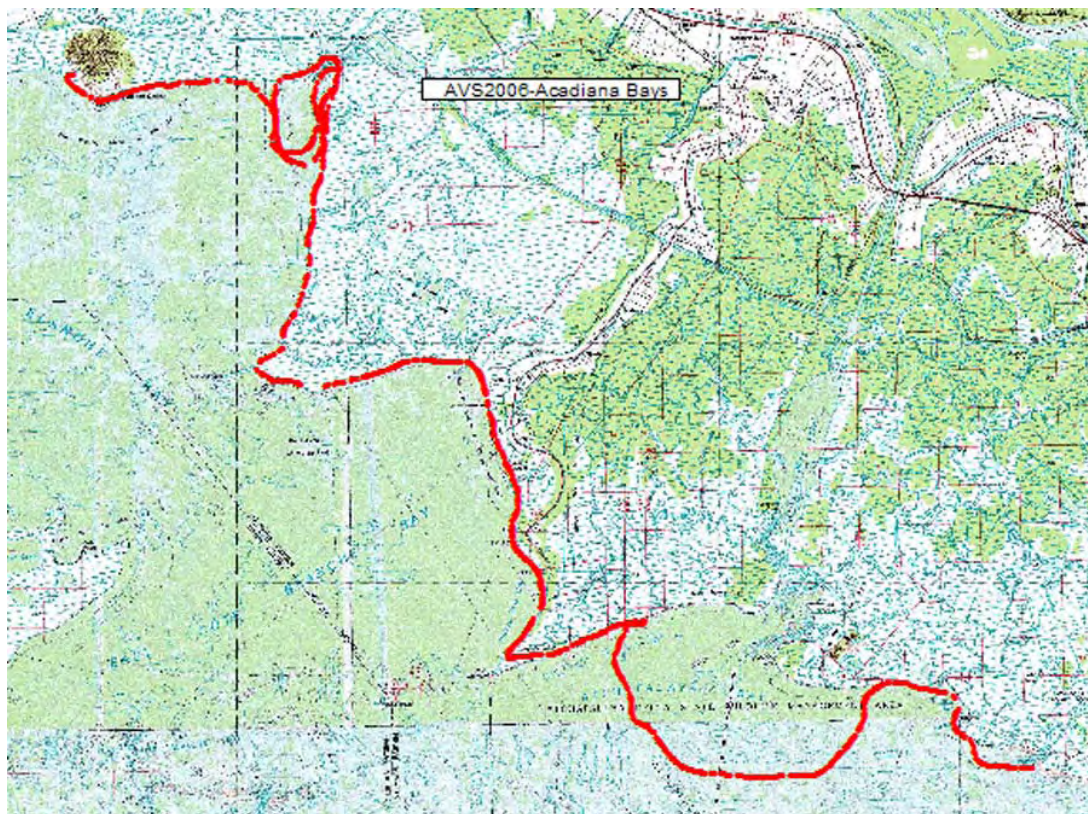


Figure 28. Location of the 2006 digital video imagery on DVD-06-A and photos on DVD-06-B taken November 20, 2006 along the Acadiana Bays shoreline from Red Bluff to Shell Island Pass, Louisiana. The direction of travel was generally to the southeast.

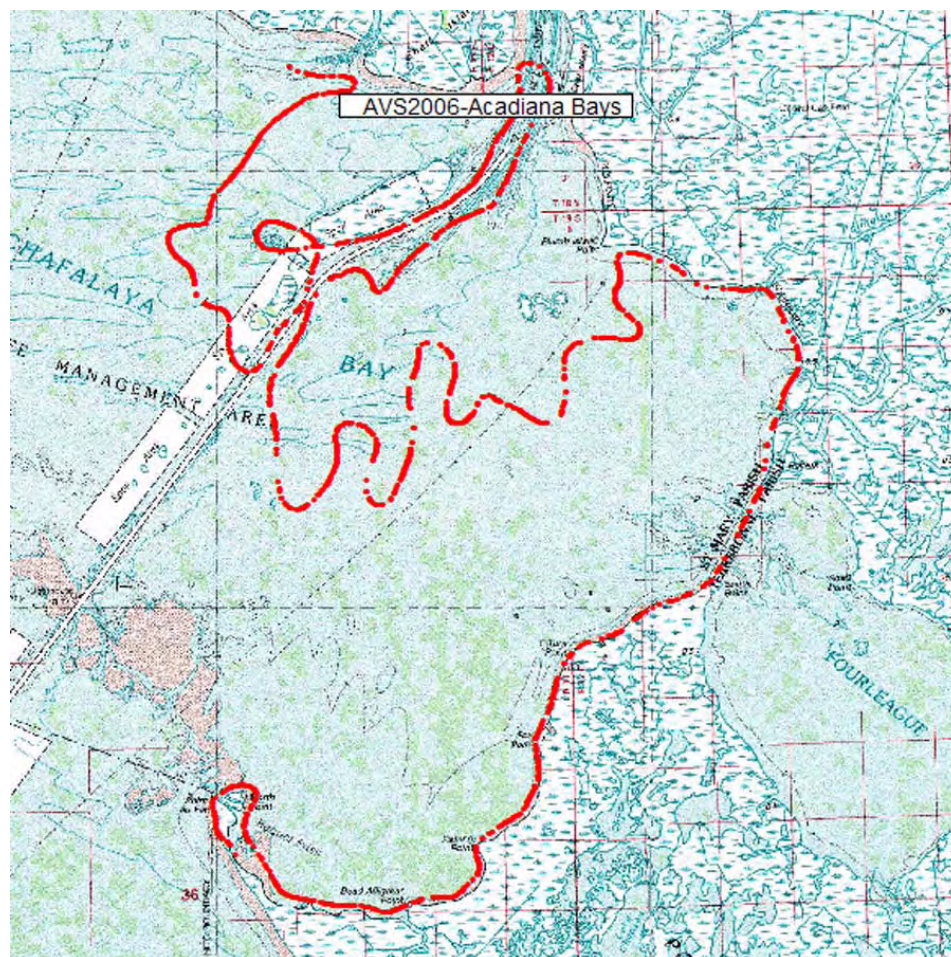


Figure 29. Location of the 2006 digital video imagery on DVD-07 taken November 21, 2006 along the Acadiana Bays shoreline from Shell Pass to Point au Fer, including the Atchafalaya Delta, Louisiana. The direction of travel was generally to the east and south.

Teche Delta

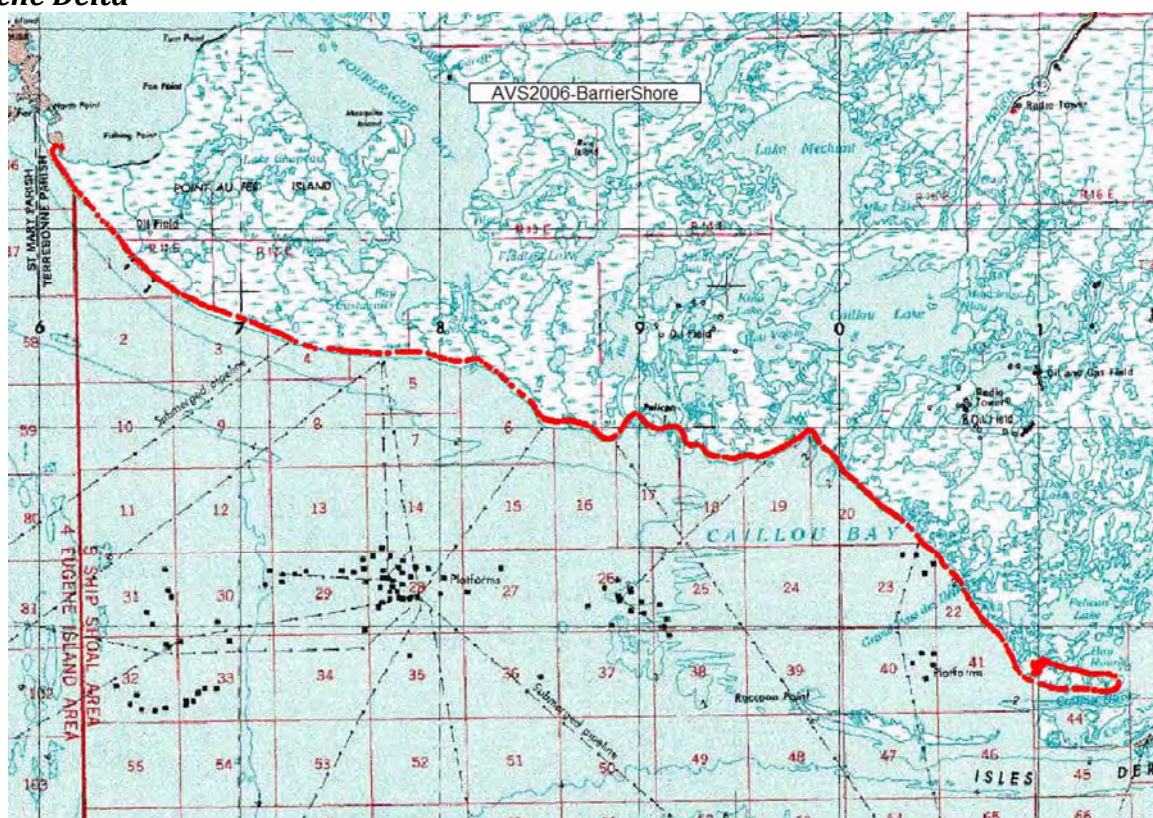


Figure 30. Location of the 2006 digital video imagery on DVD-08 taken November 21, 2006 along the Teche Delta from Point au Fer to Caillou Boca. The direction of travel was to the east.



Figure 31. Location of the 2007 digital video imagery on DVD-09 taken April 20, 2007 along the Teche Delta from Raccoon Point to Wine Island of the Isles Dernieres. The direction of travel was generally to the east.

Lafourche Delta

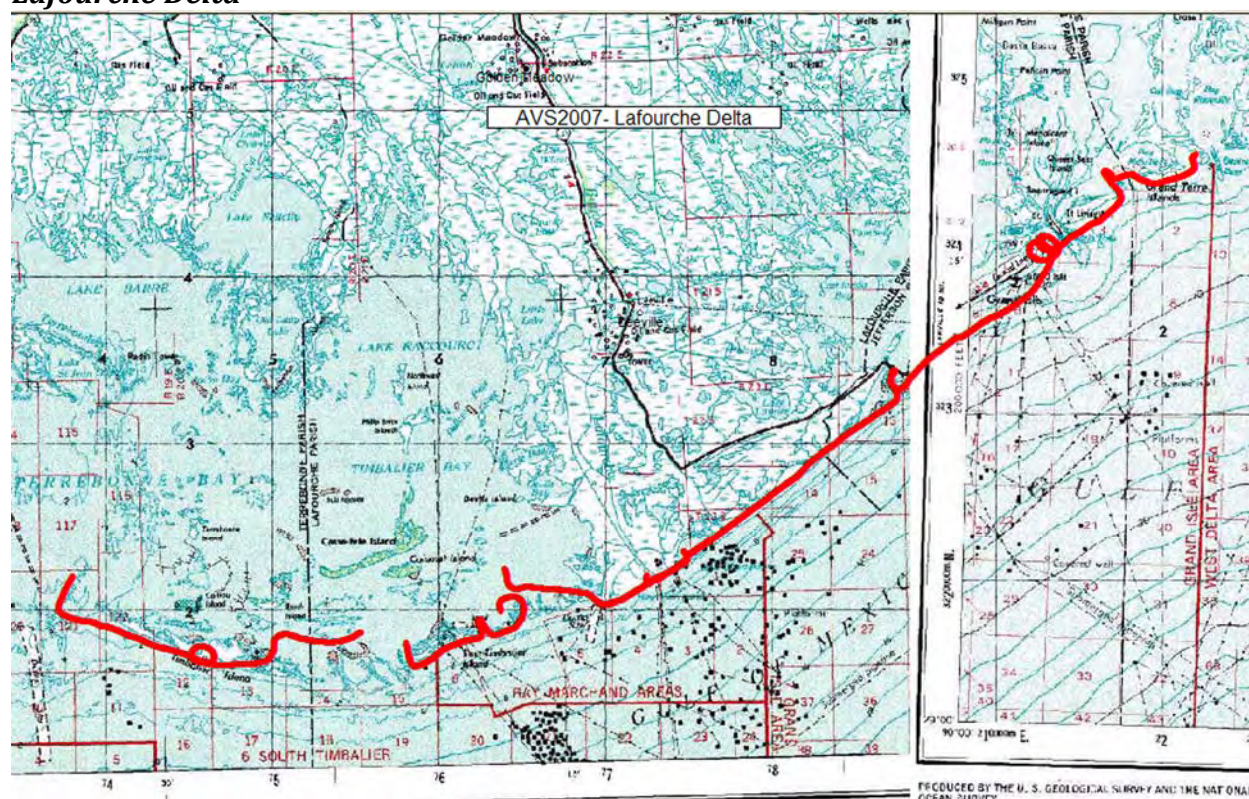


Figure 32. Location of the 2007 digital video imagery on DVD-10 taken April 20, 2007 along the Lafourche Delta Region from Timbalier Island to East Grand Terre Island. The direction of travel was generally to the east and north.

Modern Delta

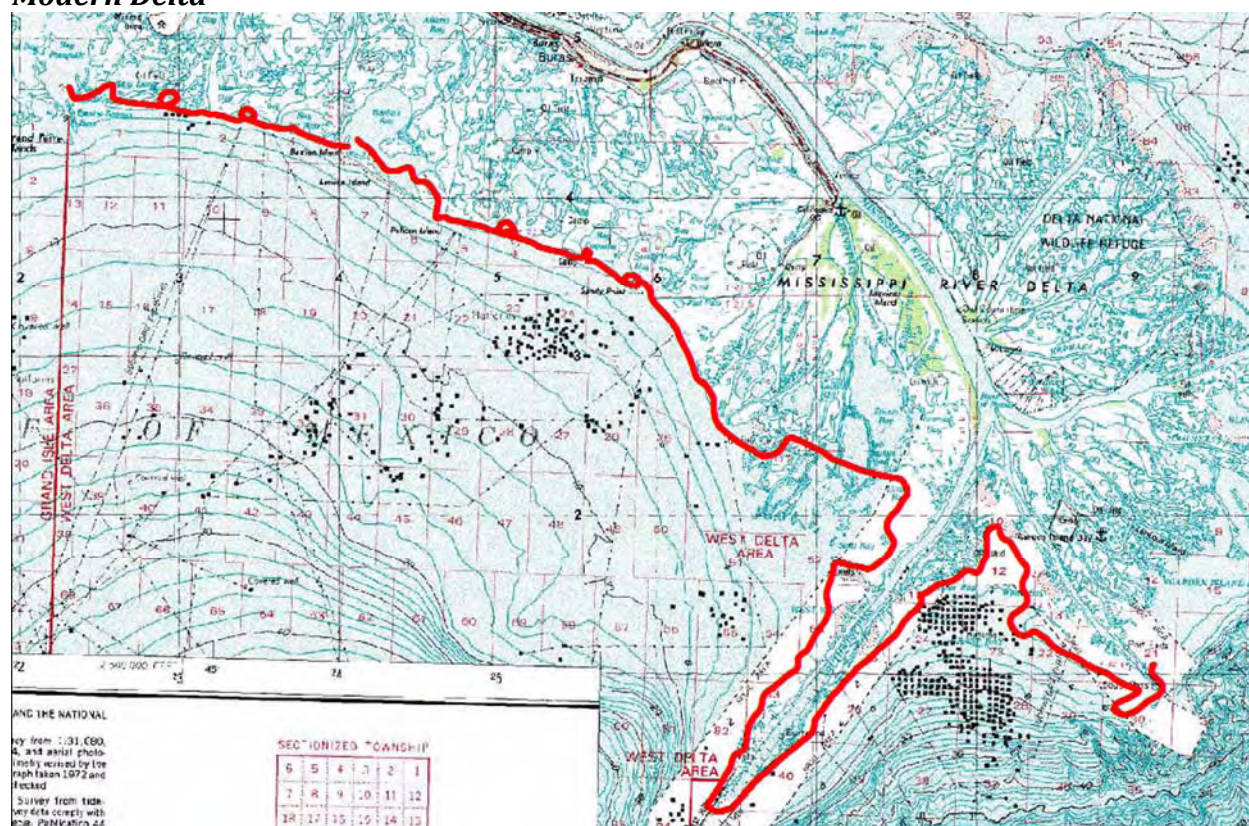


Figure 33. Location of the 2007 digital video imagery on DVD-11, taken April 20, 2007 for the Modern Delta Region along the Plaquemines shoreline from Quatre Bayou Pass to Sandy Point and the west shoreline of the Mississippi River Delta from Red Pass to South Pass. Direction of travel was generally to the south and east.

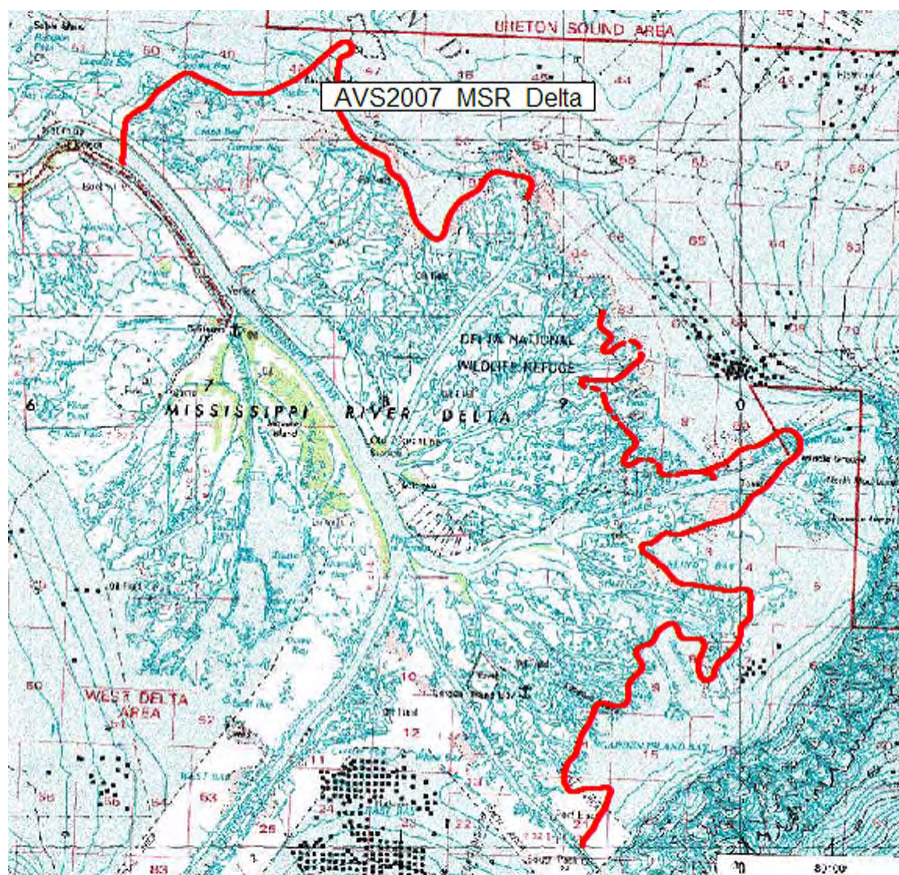
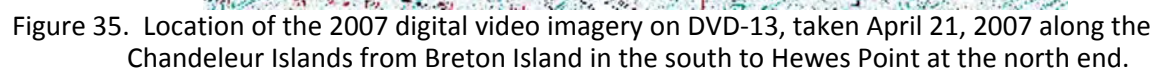


Figure 34. Location of the 2007 digital video imagery on DVD-12 taken April 20 and 21, 2007 in the BICM Modern Delta Region along the east shoreline of the Mississippi River Delta from South Pass to Deepwater Point, Louisiana. The direction of travel was generally to the north.



Lakes Region

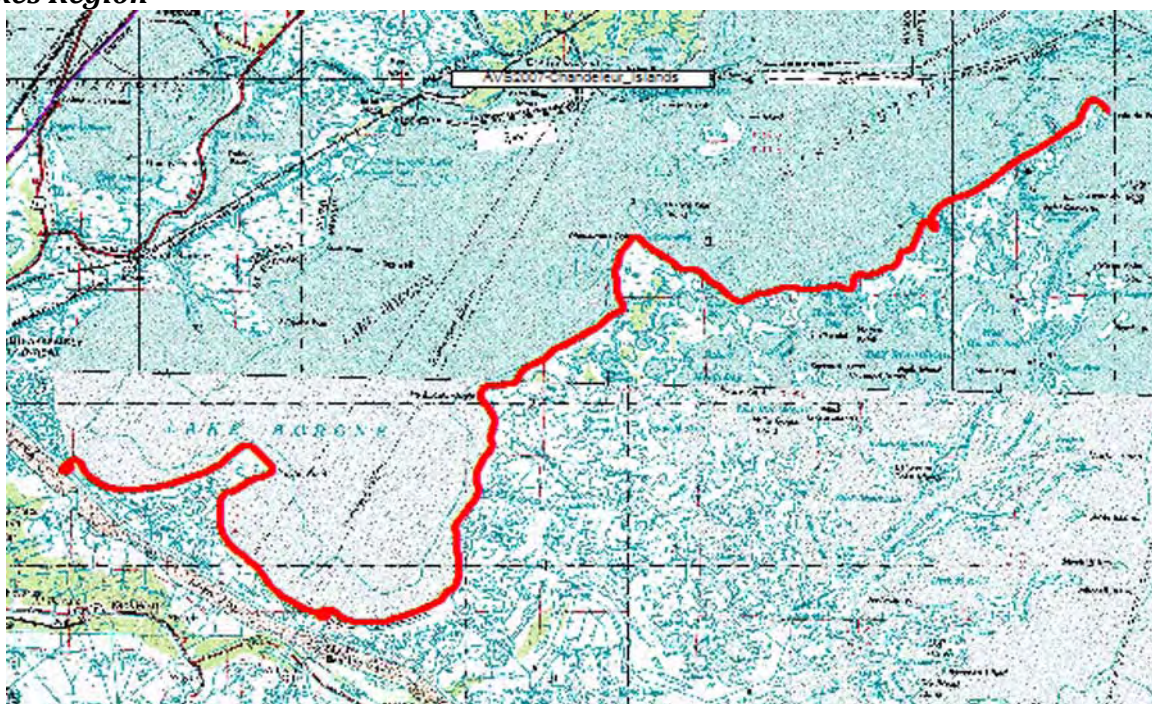


Figure 36. Location of the 2007 digital video imagery on DVD-14, taken April 21, 2007 in the BICM Lakes Region along the east and south shorelines of Lake Borgne, from Isle au Pitre to Shell Beach, Louisiana. Direction of travel was to the west.

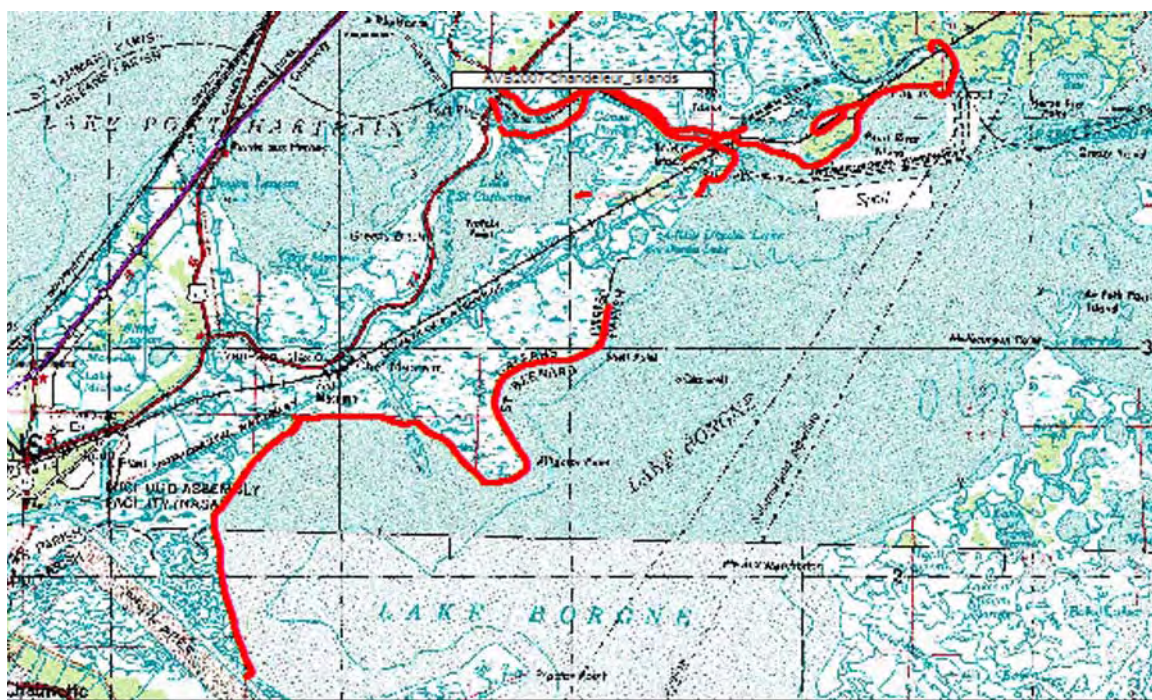


Figure 37. Location of the 2007 digital video imagery on DVD-15, taken April 21, 2007 in the BICM Lakes Region along the north shoreline of Lake Borgne from Shell Beach to the Pearl River and both banks of the Rigolets, Louisiana. Direction of travel was clockwise and generally to the east.

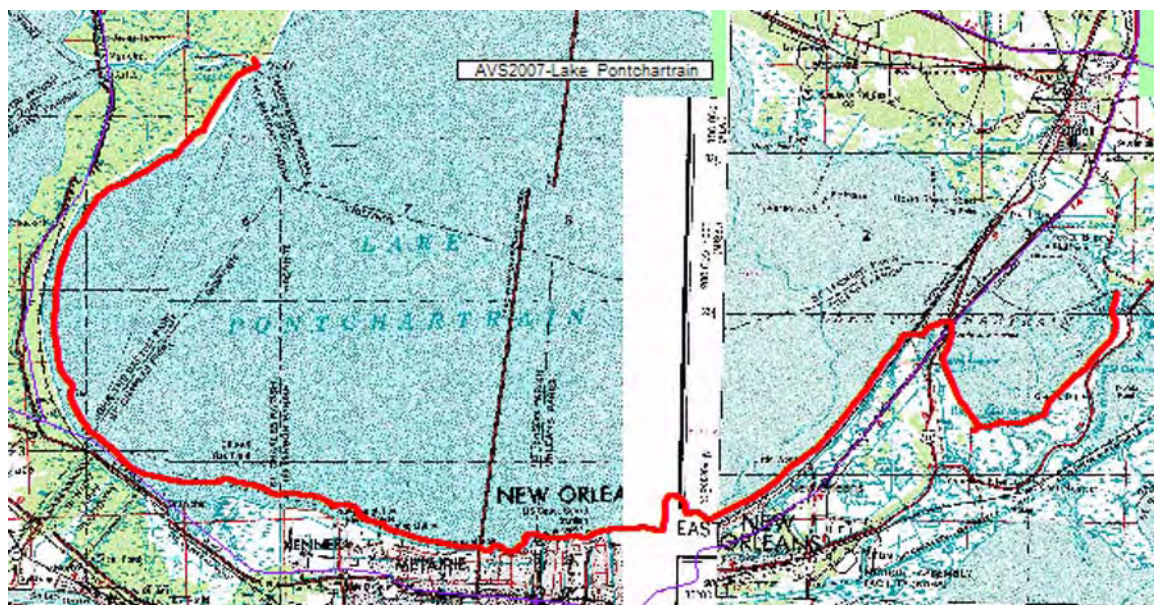


Figure 38. Location of the 2007 digital video imagery on DVD-16, taken April 21 and 22, 2007 in the BICM Lakes Region along the south shoreline of Lake Pontchartrain from the Rigolets to Pass Manchac.

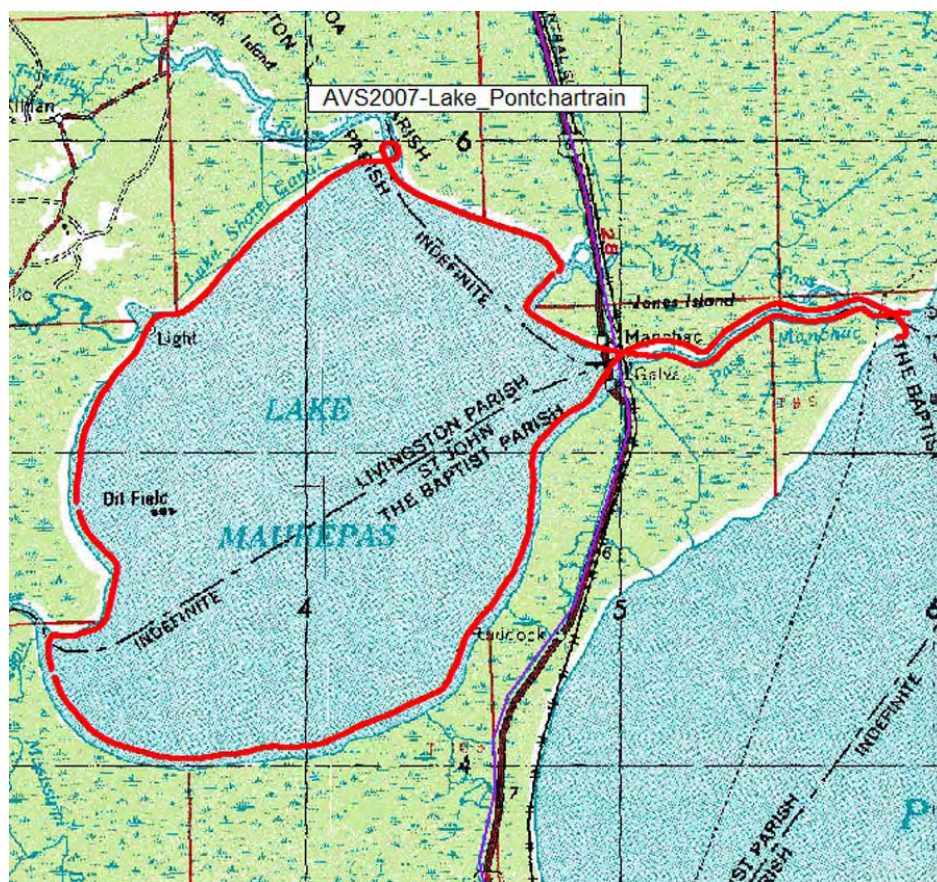


Figure 39. Location of the 2007 digital video imagery on DVD-17, taken April 22, 2007 in the BICM Lakes Region along the shoreline of Lake Maurepas moving clockwise, and both banks of Pass Manchac.

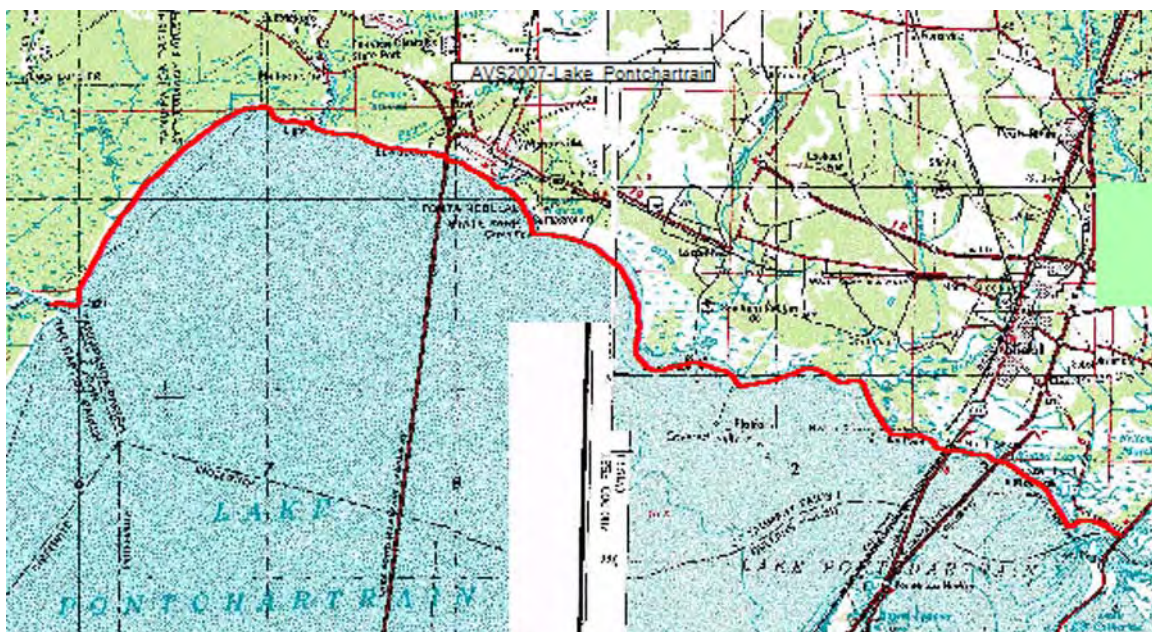


Figure 40. Location of the 2007 digital video imagery on DVD-18, taken April 22, 2007 in the BICM Lakes Region along the north shoreline of Lake Pontchartrain from to Pass Manchac to the Rigolets, Louisiana. Direction was generally to the east.