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## Louisiana Barrier Island Comprehensive Monitoring Program (BICM) Volume 3: Bathymetry and Historical Seafloor Change 1869-2007 Part 2: South Central Louisiana and Northern Chandeleur Islands, Bathymetry Maps

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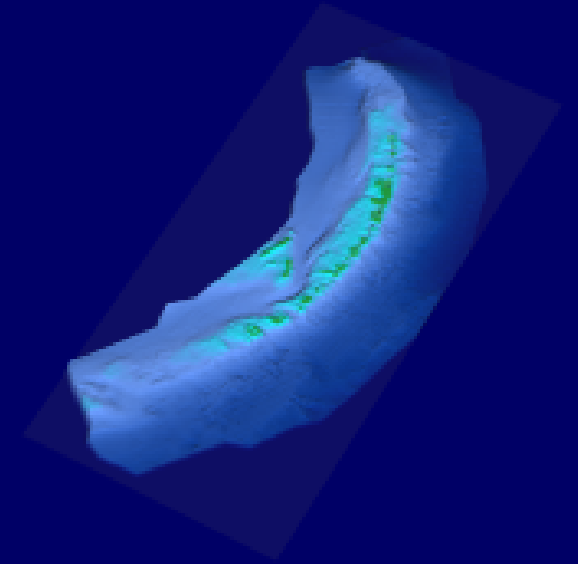
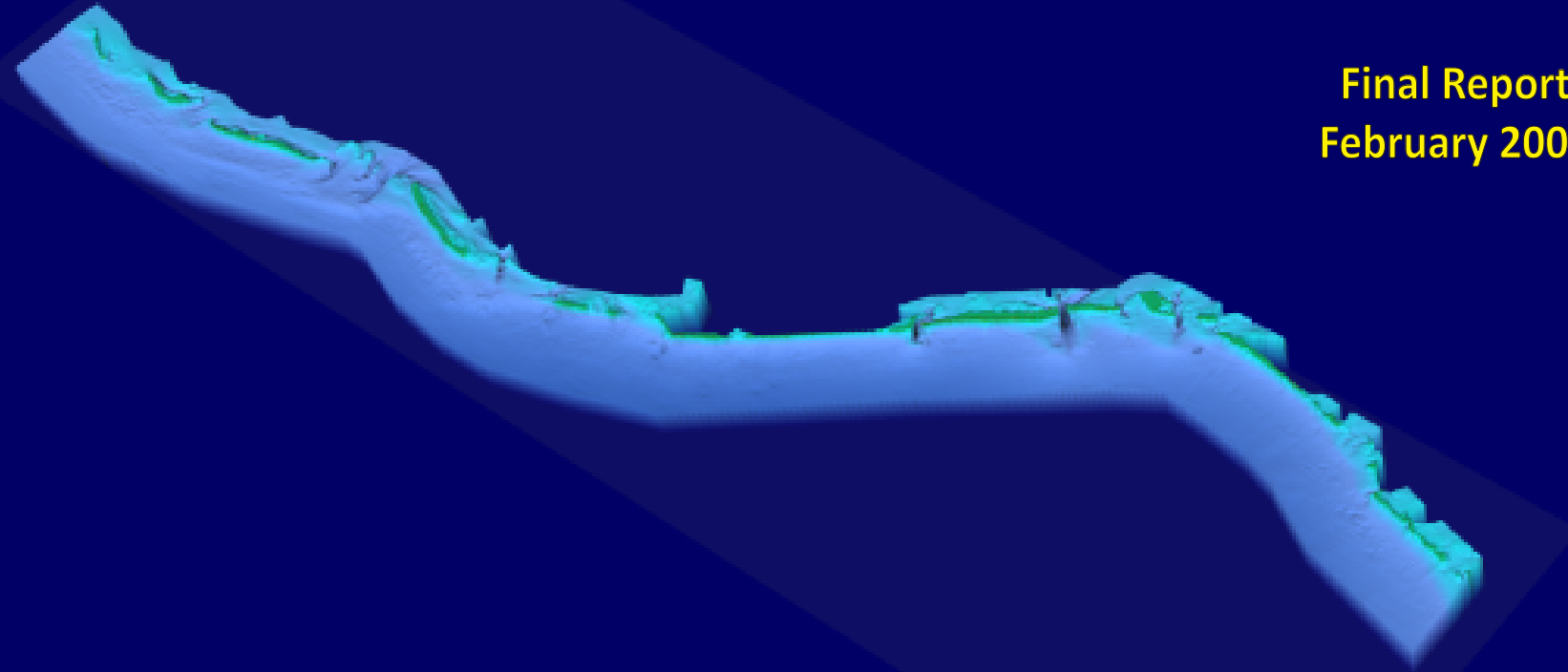
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Bathymetry Maps**

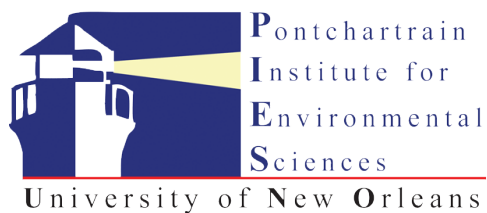
**Final Report  
February 2009**



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## INTRODUCTION

It is widely recognized and well documented that barrier islands and deltaic headland shorelines of the Louisiana Coastal Zone are rapidly retreating landward and degrading (e.g. LCA, 2005). High rates of delta plain subsidence, ongoing eustatic sea-level rise, sediment starvation, and processes such as storm impacts collectively contribute to this shoreline loss as shoreline sediment is eroded or becomes inundated by marine waters (Penland and Ramsey, 1990). The amount of shoreline retreat along coastal Louisiana has been shown to be as much as 23 m/yr locally (Williams et al., 1992), and has been a contributing factor to the more than 100 km<sup>2</sup> of annual land loss that has been documented for some select historic time frames across the region (Barras et al., 2004).

### PURPOSE

To more effectively identify the magnitude, rates, and processes of shoreline change a Barrier Island Comprehensive Monitoring program (BICM) has been developed by the Louisiana Department of Natural Resources (LDNR), University of New Orleans-Pontchartrain Institute for Environmental Sciences (UNO-PIES), and the U.S. Geological Survey (USGS) as a framework for a coast-wide monitoring effort. A significant component of this effort includes documenting the historically dynamic morphology of the Louisiana nearshore, shoreline, and backshore zones. This aspect of the program is designed to complement other more area-specific monitoring programs that are currently underway through the support of agencies such as the Louisiana Department of Natural Resources and U.S. Army Corp of Engineers.

The advantage of BICM over current project-specific monitoring efforts is that it will provide long-term morphological datasets on all of Louisiana's barrier islands and shorelines; rather than just those islands and areas that are slated for coastal engineering projects or have had construction previously completed. BICM additionally specifically provides a larger proportion of unified, long-term datasets that will be available to monitor constructed projects, plan and design future barrier island projects, develop operation and maintenance activities, and assess the range of impacts created by past and future tropical storms. The development of coastal models, such as those quantifying littoral sediment budgets, and a more advanced knowledge of mechanisms

forcing large-scale coastal evolution becomes increasingly feasible with the availability of BICM regional datasets. These factors constitute critically important elements of any effort that is aimed at effective coastal restoration, sediment nourishment, or management.

### CURRENT BICM GOALS AND TASKS

Data for BICM tasks is collected and compiled for all of the barrier island systems and shorelines with similar approaches and methodologies. The resulting data will be more comparable, consistent, accurate, and complete than currently available barrier island geomorphology datasets that have been piece-meal constructed and are generally area specific. In order to achieve the goals of BICM and develop a range of usable, stand-alone datasets the entire effort has been broken into several research and analysis tasks. These currently include:

- 1) compilation of videography and photography of the 2005 hurricane impacts,
- 2) construction of a unified historic shoreline change database for the Louisiana coastal zone,
- 3) development of a historical bathymetric database with up-to-date 2006 and 2007 bathymetric data and historical seafloor change analysis for the sandy shorelines extending from Sandy Point to Raccoon Point, the Chandeleur Islands, and the Chenier Plain Beaches,
- 4) Light Detection and Ranging (LiDAR) surveys for the sandy shorelines of the coastal zone,
- 5) barrier island habitat classification mapping,
- 6) sediment sampling and grain size analysis for onshore, nearshore, and shoreface environments along the sandy shorelines of the coastal zone, and
- 7) conducting a series of public workshops to allow potential users to provide input during the planning, processing, and reporting stages, and to disseminate final results.

### PREVIOUS STUDIES

Prior to the implementation of BICM the only regionally consistent documentation for bathymetry and seafloor change available was presented in a United States Geological Survey (USGS) and Louisiana Geological Survey (LGS) atlas on seafloor change (List et al., 1994). This

atlas provided historical bathymetric data from the 1880's, 1930's, and 1980's for the central Louisiana coastal zone. Patterns and rates of seafloor change (e.g. erosion and deposition) were identified by an inter-comparison of bathymetry for designated time periods (e.g. 1880's-1930's and 1930's-1980's) along the south-central Louisiana coastline from Raccoon Island to Sandy Point. This seminal effort by List et al. (1994) has been invaluable in attempting to document the regional coastal evolution across multi-decadal time scales. This current study relies heavily on the methods developed and data from List et al. (1994). Since the acquisition of regional data in 1980 and development of the USGS atlas, no comprehensive effort has been undertaken to document the shallow, nearshore bathymetry and more recent seafloor change. Moreover, prior to the establishment of the BICM priorities there had been no comprehensive database of bathymetry and/or seafloor change for the Chandeleur Islands.

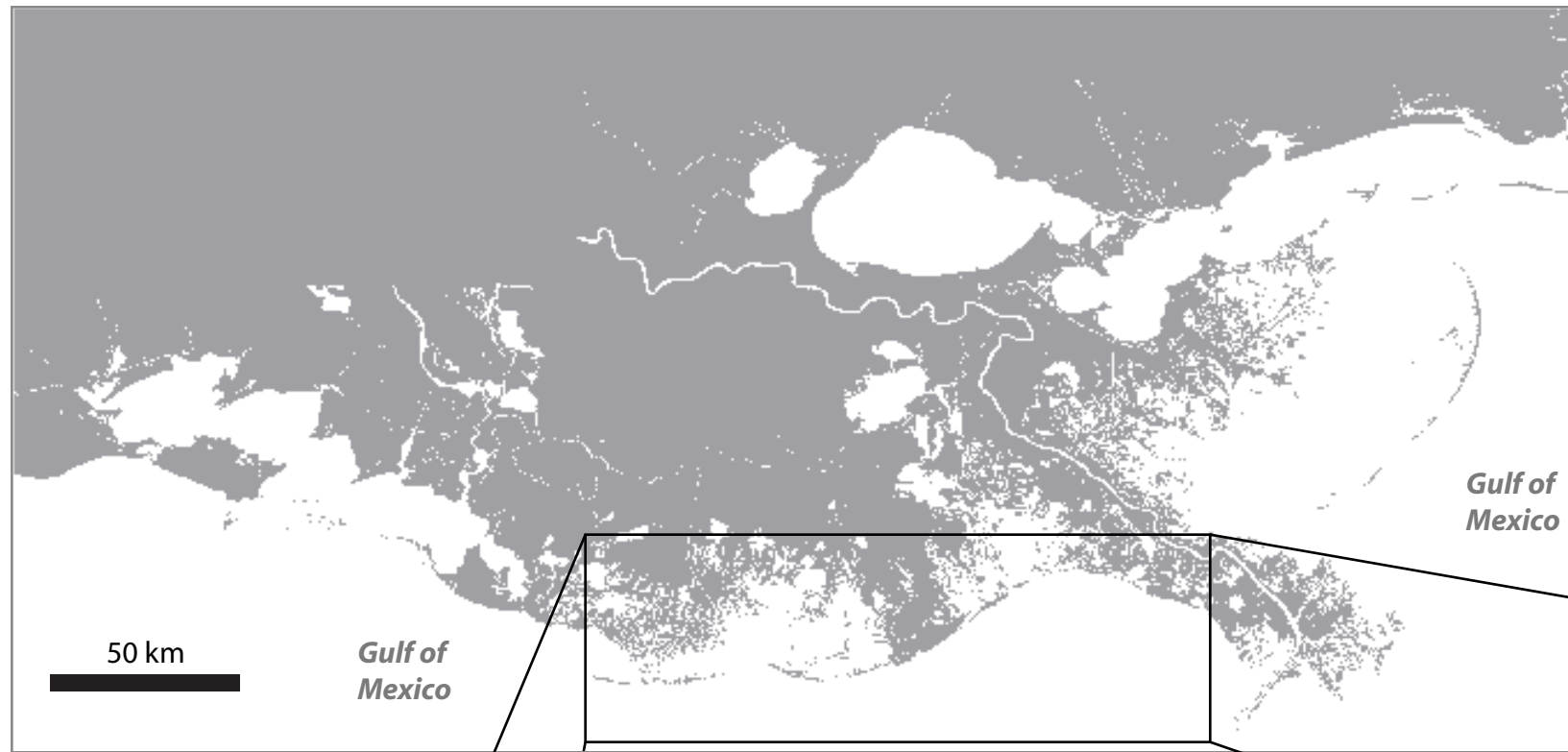
#### THIS REPORT

This report is the second part in BICM Volume 3 focusing on the bathymetry and seafloor change for Raccoon Point to Sandy Point and northern Chandeleur Islands barrier shorelines (Fig. 1). This document is not intended to be used as a stand-alone reference without a complete understanding of the methodology detailed in Part 1 of this series. Contained within this volume are the results of a two-year-long effort to: 1) assimilate into one database an array of known historical bathymetric datasets for the study areas, 2) develop the most regionally comprehensive, up-to-date, high-resolution bathymetric dataset available for the study areas, and 3) shift bathymetric data from various time periods into a common vertical and horizontal datum so that all of the data for different time periods are comparable. The approach, methods, quality control and uncertainty analysis results are contained within Part 1 of BICM Volume 3 which also documents the sources of pre-2006 bathymetric data and the methods used to create, from these sources, digital data that is based on common vertical and horizontal reference frames. Subsequent reports (BICM Vol. 3, Parts 3-5) will employ the historical and 2006 datasets to derive patterns and rates of seafloor change (erosion and accretion), calculate volumes of sediment erosion or accretion, and interpret regional coastal evolution trends within the study areas. Shorelines used in this report were generated for BICM Volume 2, *Shoreline Change Analysis, 1800's to 2005*. A detailed account of the methods and data sources for the shorelines can be found in Martinez et al. (2009).



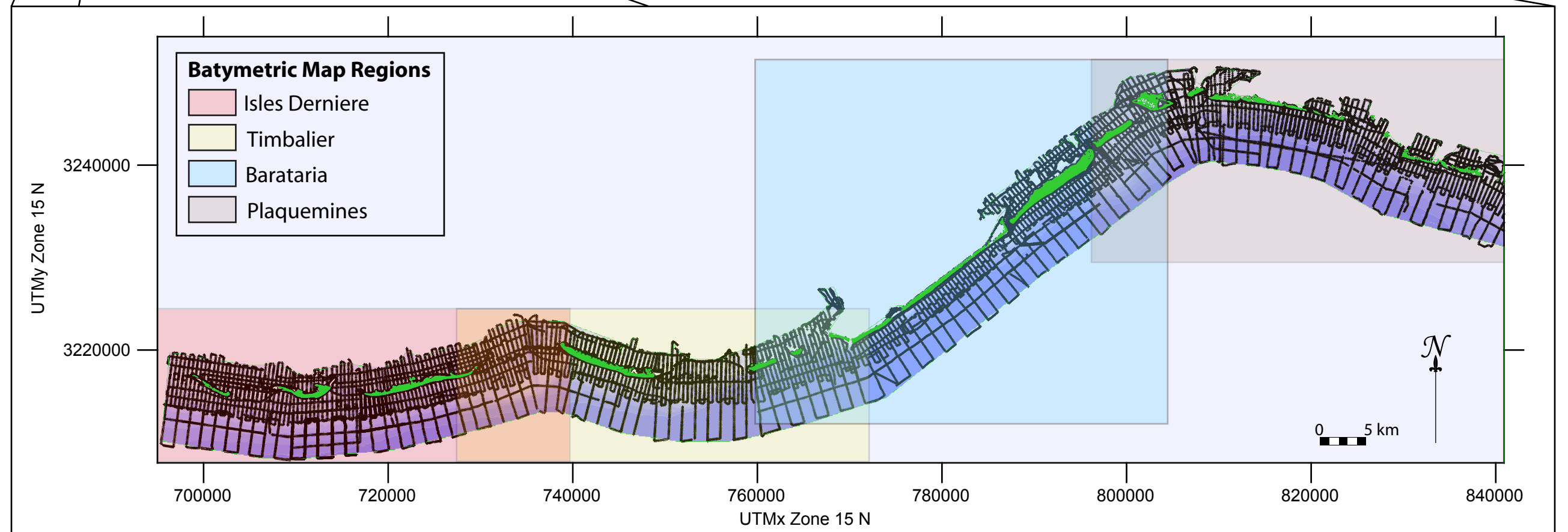
**Figure 1.** Satellite image of the eastern Louisiana coastline showing BICM Tasks 5 and 6 study areas of Sandy Point to Raccoon Point (A) and the northern Chandeleur Islands (B), respectively.

# 2006 Bathymetric Survey Coverage: Raccoon Point to Sandy Point



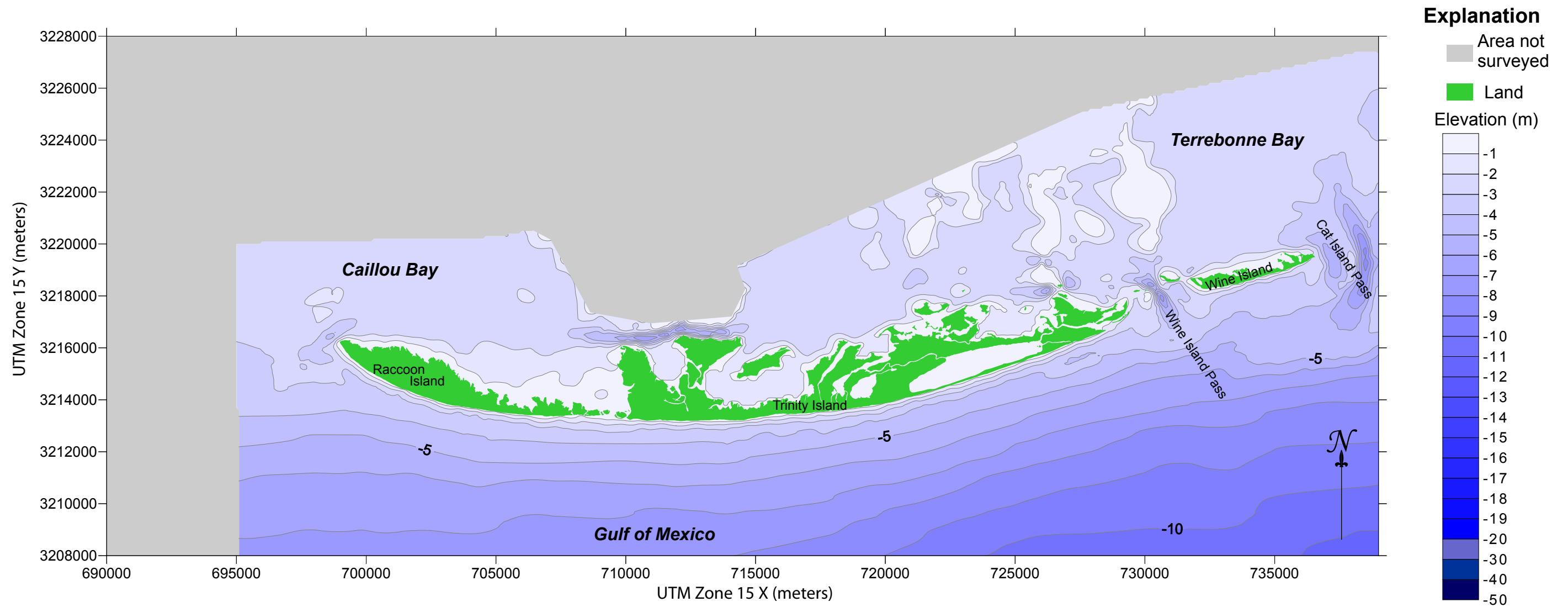
Bathymetric data coverage for 2006 acquired during bathymetric surveys conducted by the University of New Orleans Pontchartrain Institute for Environmental Sciences and the U.S. Geological Survey. Black transects indicate single-beam bathymetric data coverage. For details on methodology for bathymetric data collection and processing see Volume I of this report. Shorelines are derived from Martinez et al. (2008). Transparent colored rectangles delineate the four regions in which the Raccoon Point to Sandy Point data are broken down for map presentation in this report.

Bathymetric data coverage for Raccoon Point to Sandy Point for earlier years (1890's to 1980's) covered in this report can be found in List et al. (1994).





# Isles Derniere Region 1890's Bathymetry



### Bathymetric Data

The bathymetric data on this map is from List et al. (1994) and was acquired from hydrographic surveys conducted 1878-1891. Depths are given relative to North American Vertical Datum 1988 and were converted from mean low water (MLW) at the time of the survey for comparison to other time periods within a common vertical datum. See details in Part 1 of this report for vertical datum conversion methodology.

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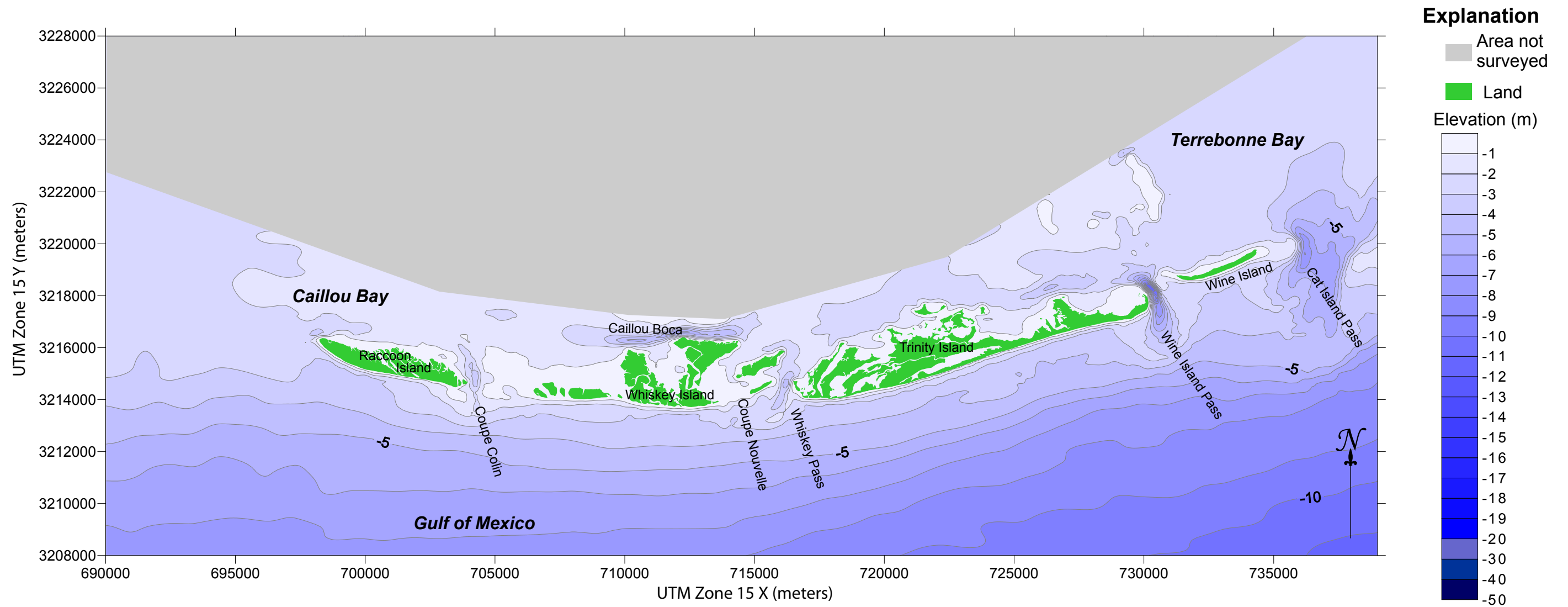


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Horizontal datum: North American Datum 1983

### Supratidal Areas

Shoreline data from 1884 and 1887 were derived from T-Sheets scanned into digital format at a scale of 1:20,000 by UNO-PIES. For details on shoreline processing methodology see Martinez et al. (2009). Note that shorelines were delineated at mean high water for the time of the survey and the bathymetric data is referenced to NAVD88.

# Isles Derniere Region 1930's Bathymetry



## Bathymetric Data

The bathymetric data on this map is from List et al. (1994) and was acquired from hydrographic surveys conducted 1933-1936. Depths are given relative to North American Vertical Datum 1988 and were converted from mean low water (MLW) at the time of the survey for comparison to other time periods within a common vertical datum. See details in Part 1 of this report for vertical datum conversion methodology.

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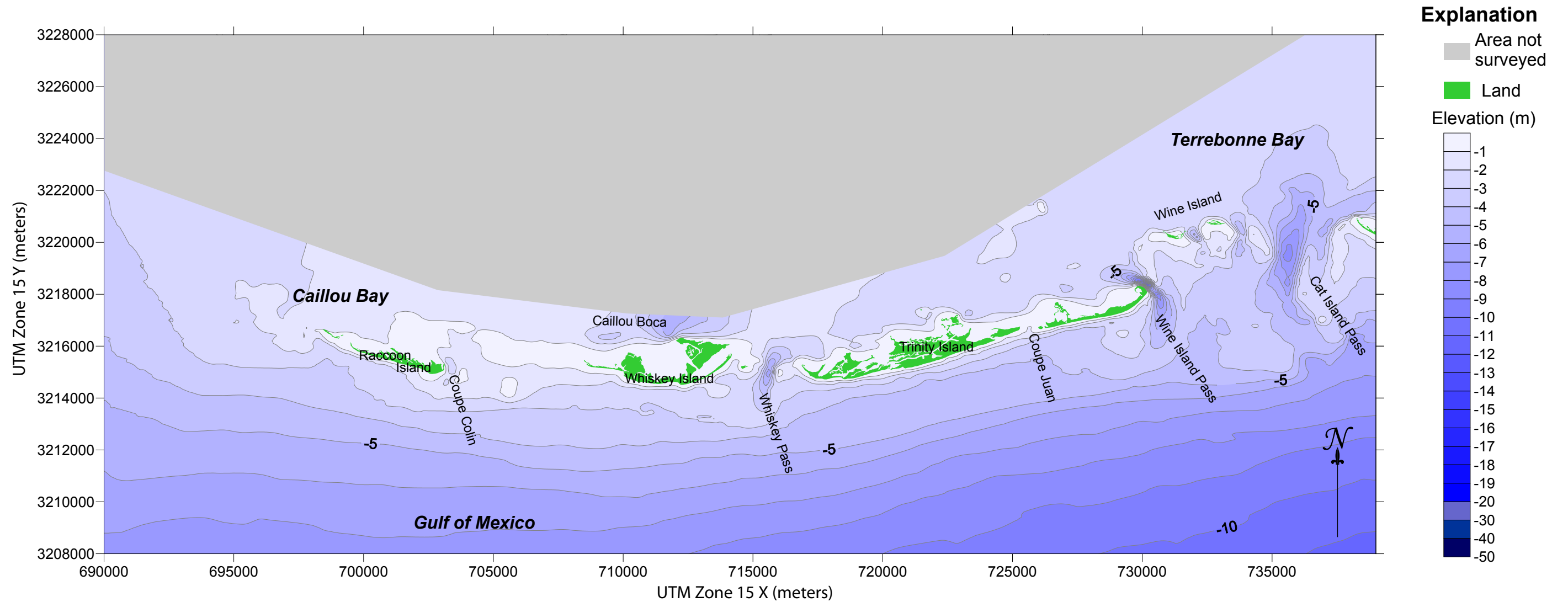


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Horizontal datum: North American Datum 1983

## Supratidal Areas

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# Isles Derniere Region 1980's Bathymetry



## Bathymetric Data

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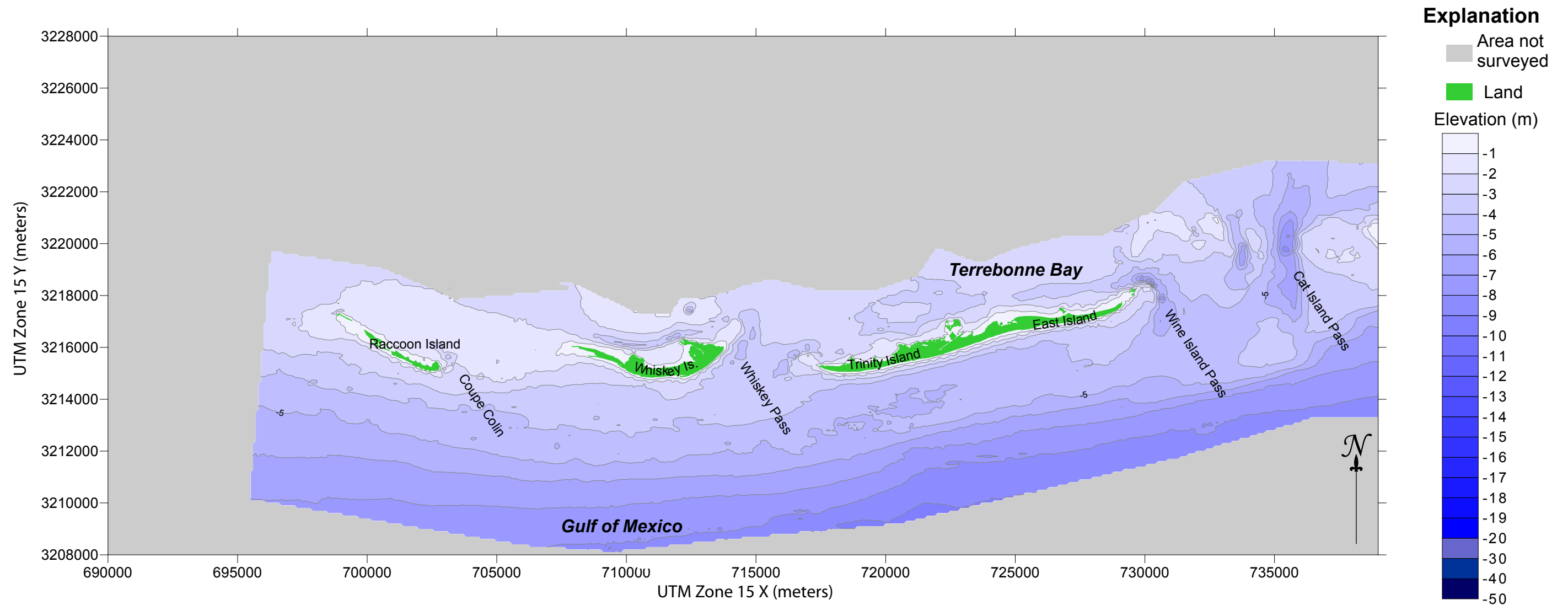


Vertical datum: NAVD88  
Horizontal datum: North American Datum 1983

## Supratidal Areas

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# Isles Derniere Region 2006 Bathymetry



## Bathymetric Data

The bathymetric data on this map was acquired from hydrographic surveys conducted in 2006 by UNO-PIES and USGS. Depths are given relative to North American Vertical Datum 1988 (NAVD88). Not to be used for navigation purposes.

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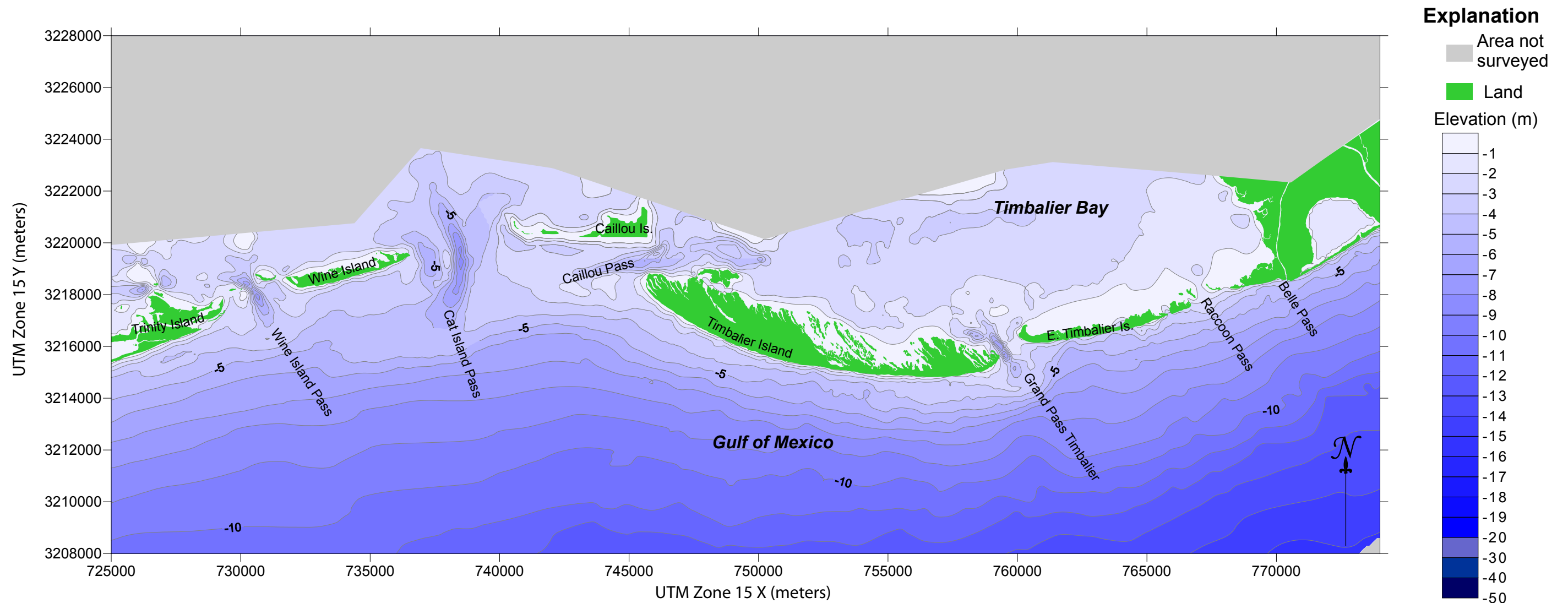


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Horizontal datum: North American Datum 1983 (2004.65)

## Supratidal Areas

The areas shown in green were assigned an elevation value of 0.5 meters. Shoreline data from 2005 were derived from a combination of Digital Ortho-Quarter Quads (DOQQs) and Digital Globe Quickbird satellite imagery obtained by UNO-PIES. The shorelines were derived from thematic land/water classifications produced from these image datasets and subsequent GIS editing by UNO-PIES.

# Timbalier Region 1890's Bathymetry



## Bathymetric Data

The bathymetric data on this map is from List et al. (1994) and was acquired from hydrographic surveys conducted 1878-1891. Depths are given relative to North American Vertical Datum 1988 and were converted from mean low water (MLW) at the time of the survey for comparison to other time periods within a common vertical datum. See details in Part 1 of this report for vertical datum conversion methodology.

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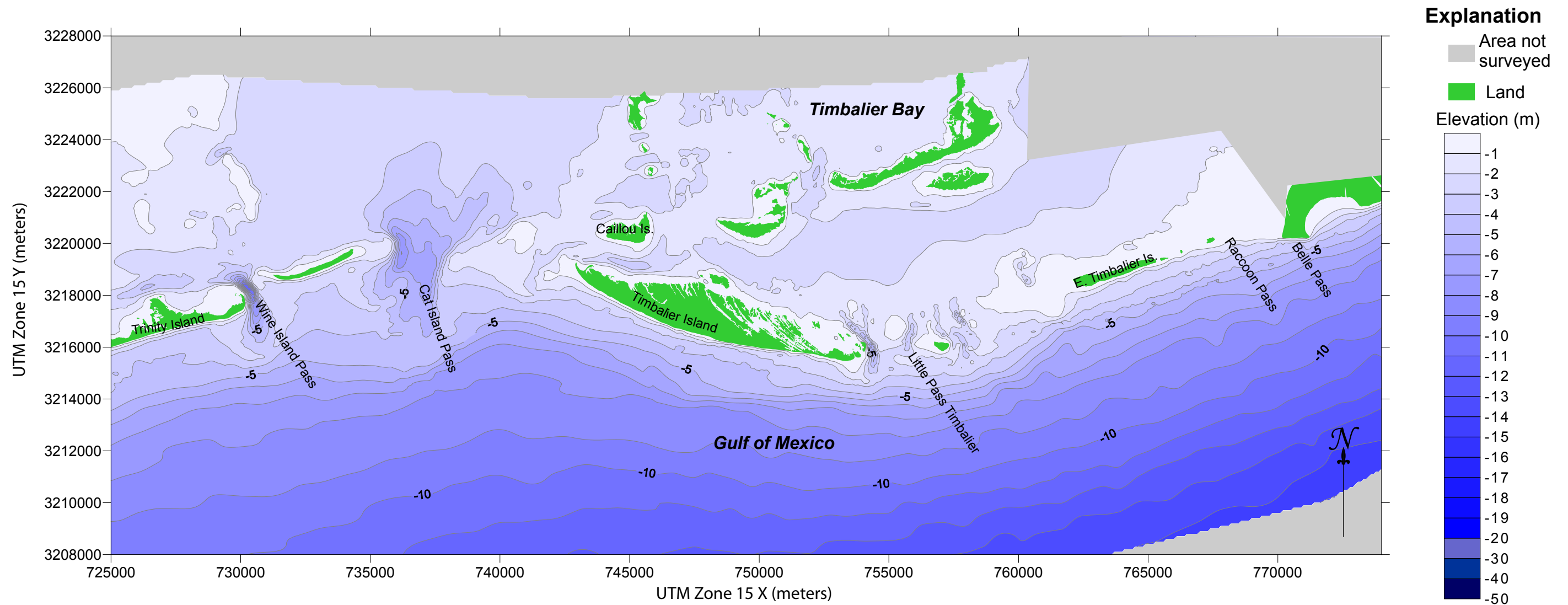


Vertical datum: NAVD88  
Horizontal datum: North American Datum 1983

## Supratidal Areas

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# Timbalier Region 1930's Bathymetry



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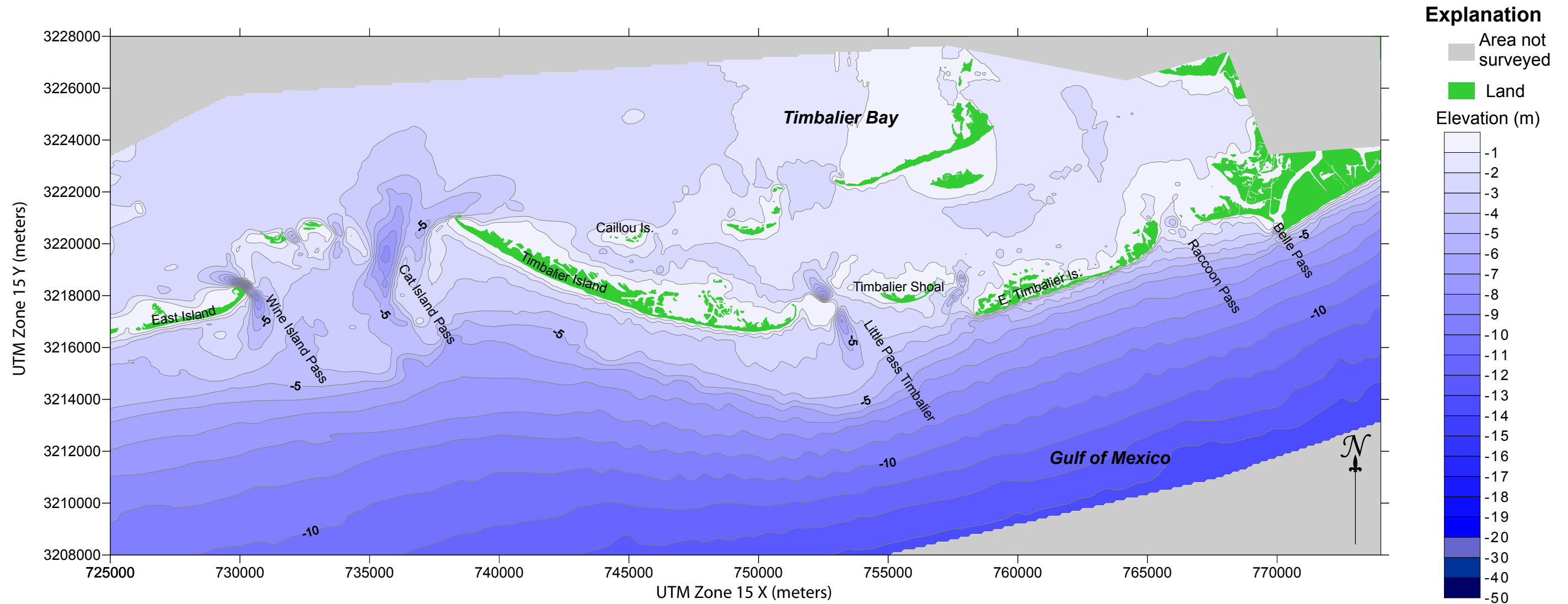


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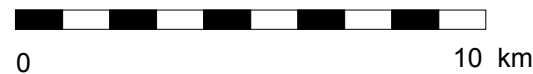
# Timbalier Region 1980's Bathymetry



## Bathymetric Data

The bathymetric data on this map is from List et al. (1994) and was acquired from hydrographic surveys conducted 1988-1989. Depths are given relative to North American Vertical Datum 1988 and were converted from mean lower low water (MLLW) relative to the Grand Isle tide gauge for the 1960-1978 tidal epoch so that these data are comparable to other data sets within a common vertical datum. See details in Part 1 of this report for vertical datum conversion methodology.

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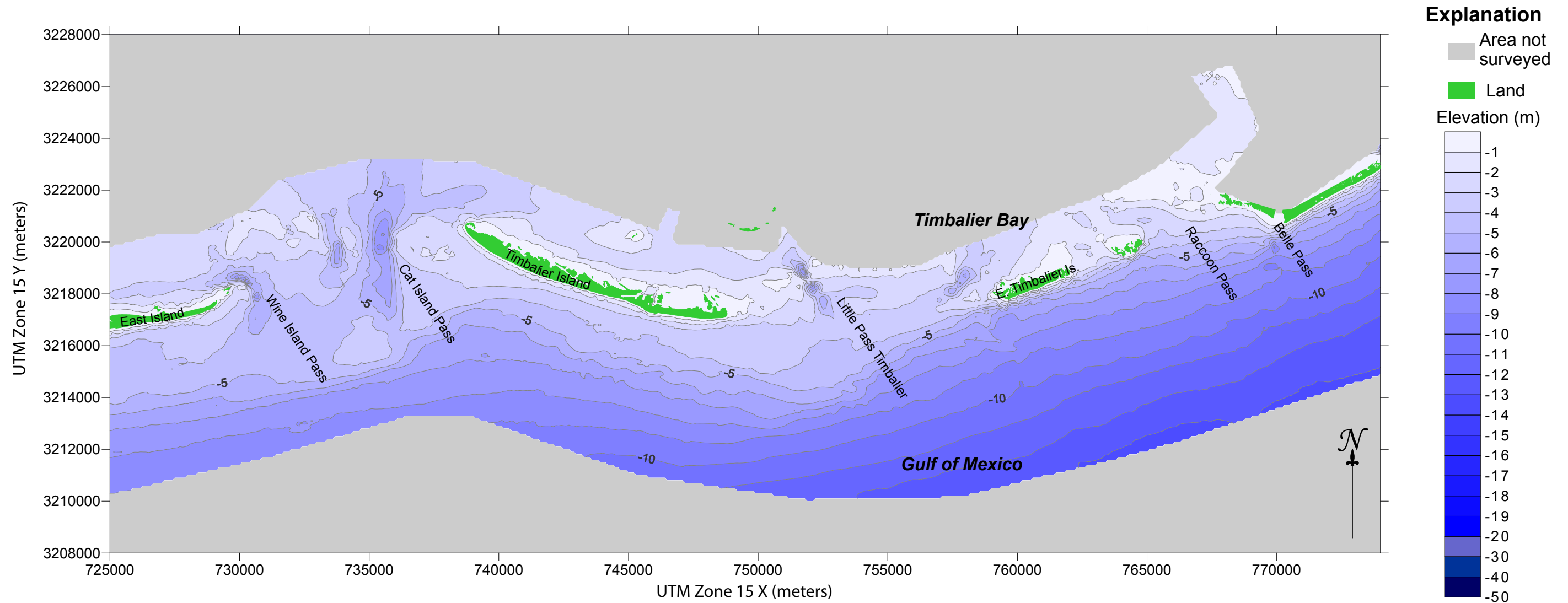


Vertical datum: NAVD88  
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# Timbalier Region 2006 Bathymetry



## Bathymetric Data

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## Scale:



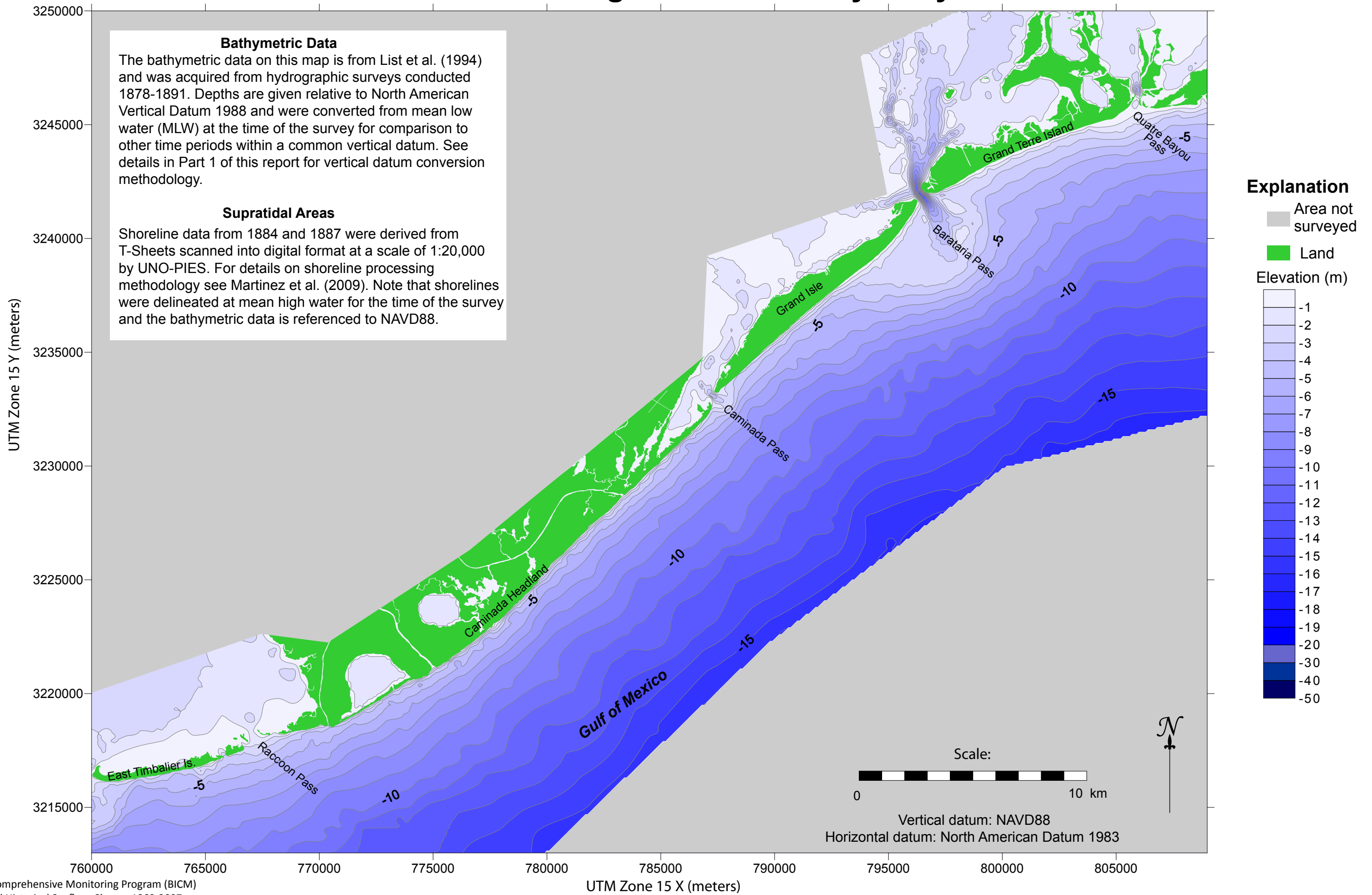
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Horizontal datum: North American Datum 1983 (2004.65)

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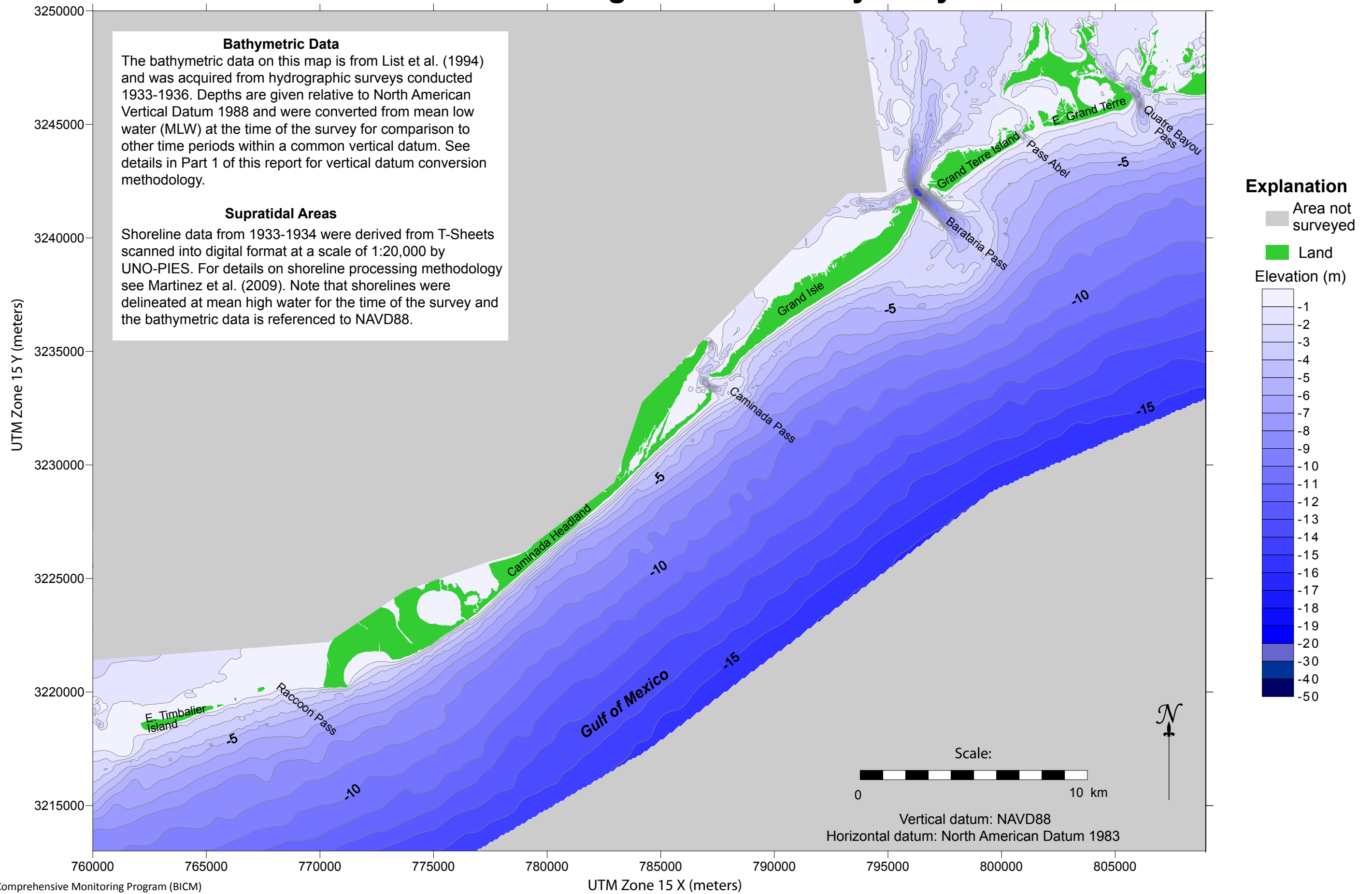
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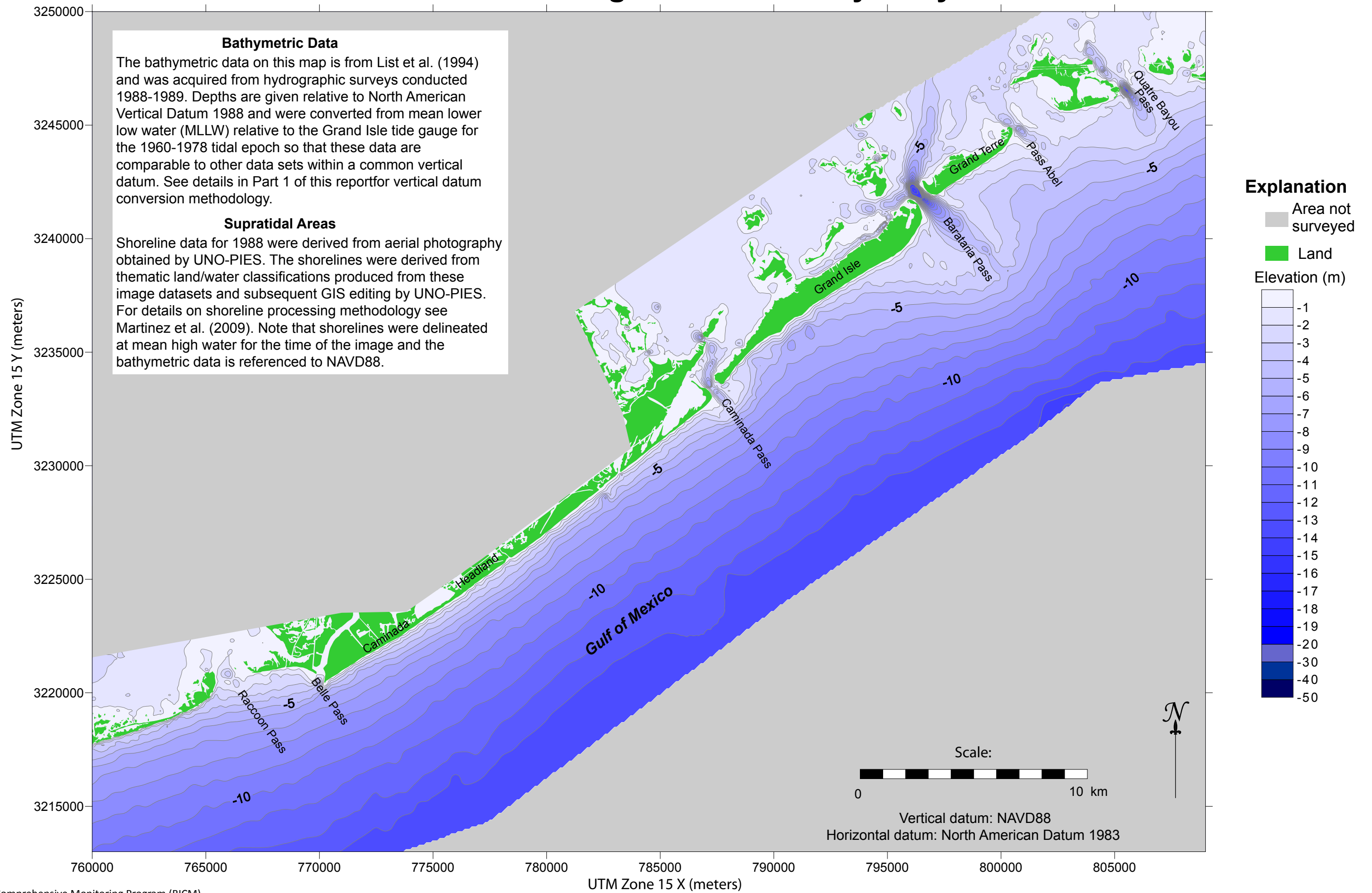
# Barataria Region 1890's Bathymetry



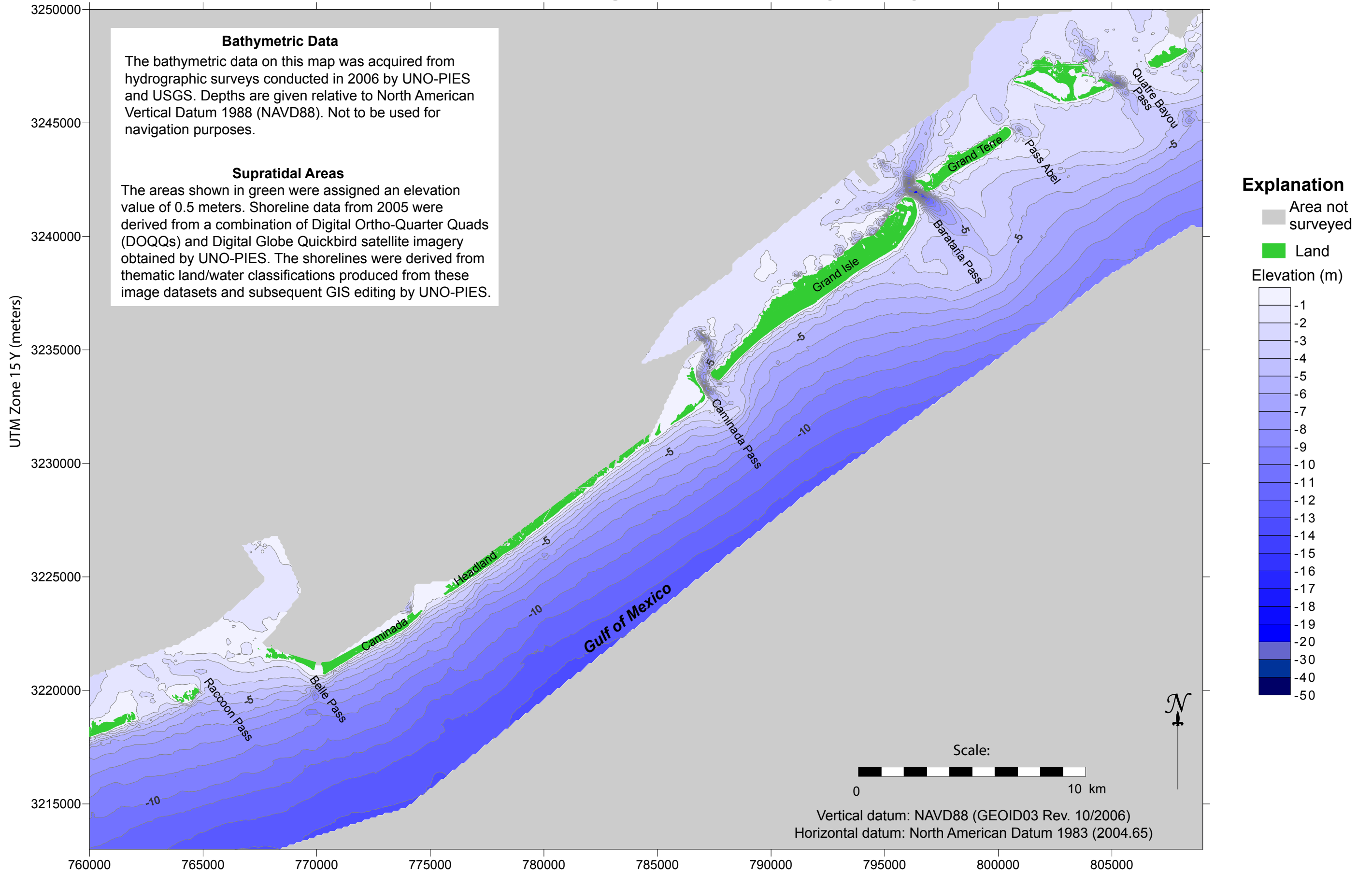
# Barataria Region 1930's Bathymetry



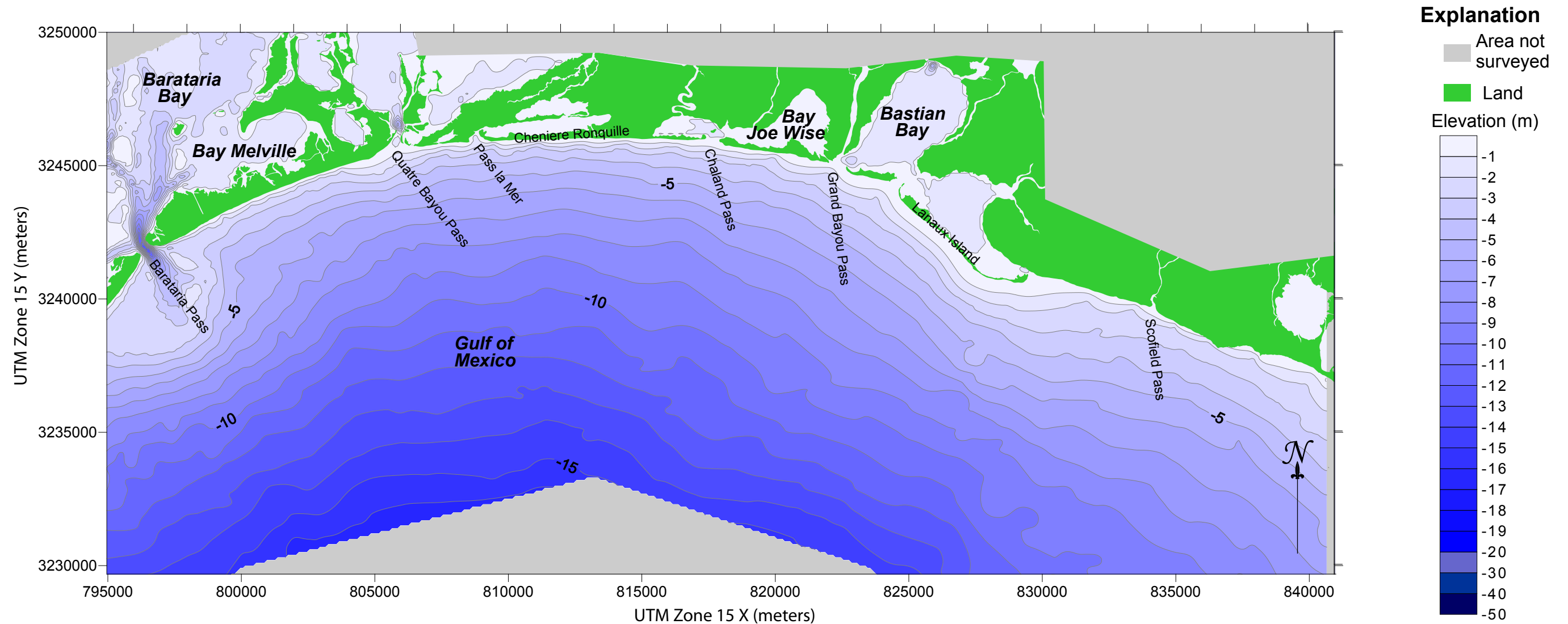
# Barataria Region 1980's Bathymetry



# Barataria Region 2006 Bathymetry



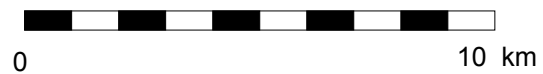
# Plaquemines Region 1890's Bathymetry



## Bathymetric Data

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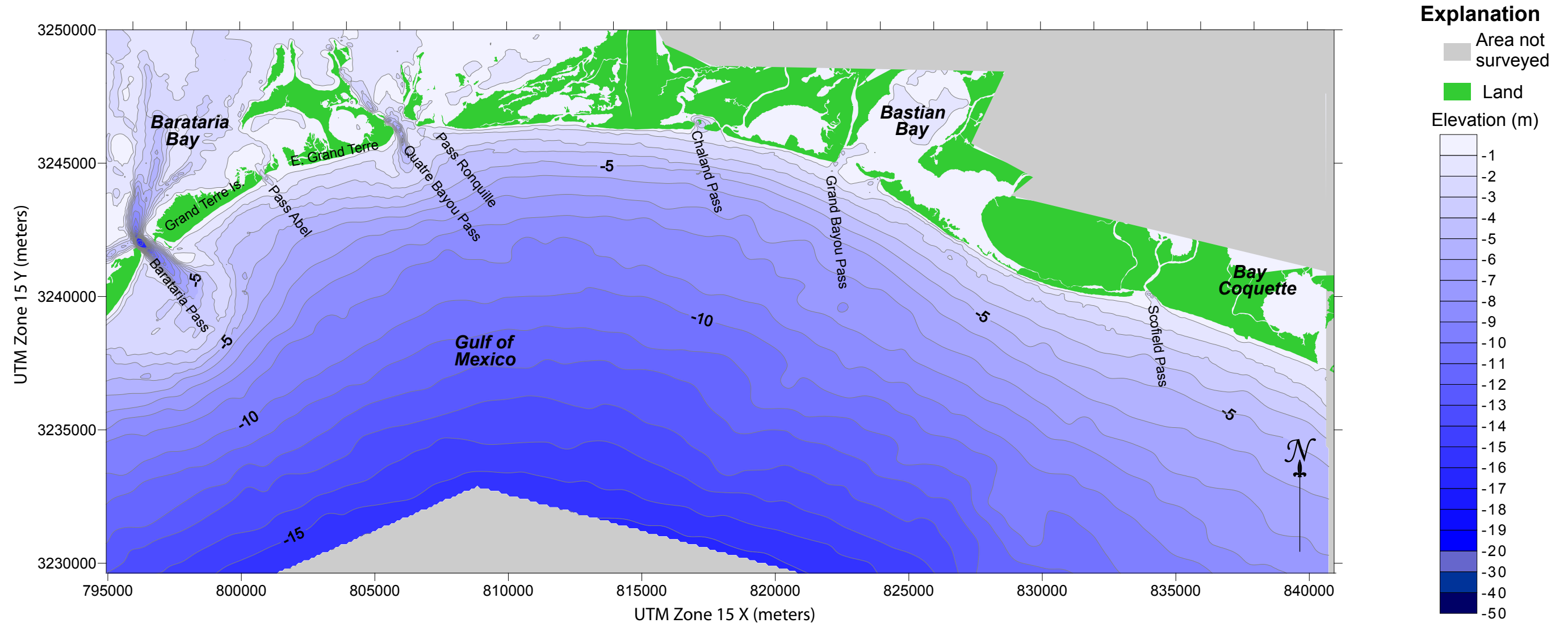


Vertical datum: NAVD88  
Horizontal datum: North American Datum 1983

## Supratidal Areas

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# Plaquemines Region 1930's Bathymetry



## Bathymetric Data

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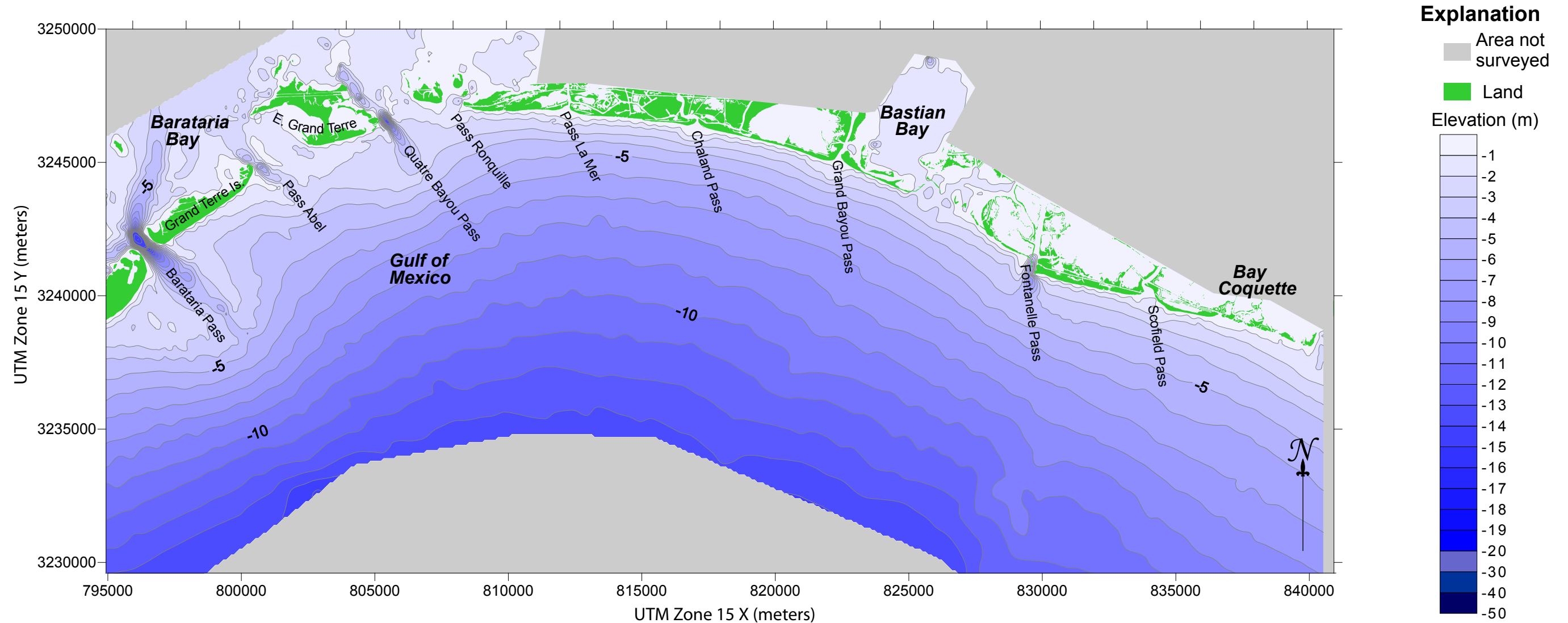


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# Plaquemines Region 1980's Bathymetry



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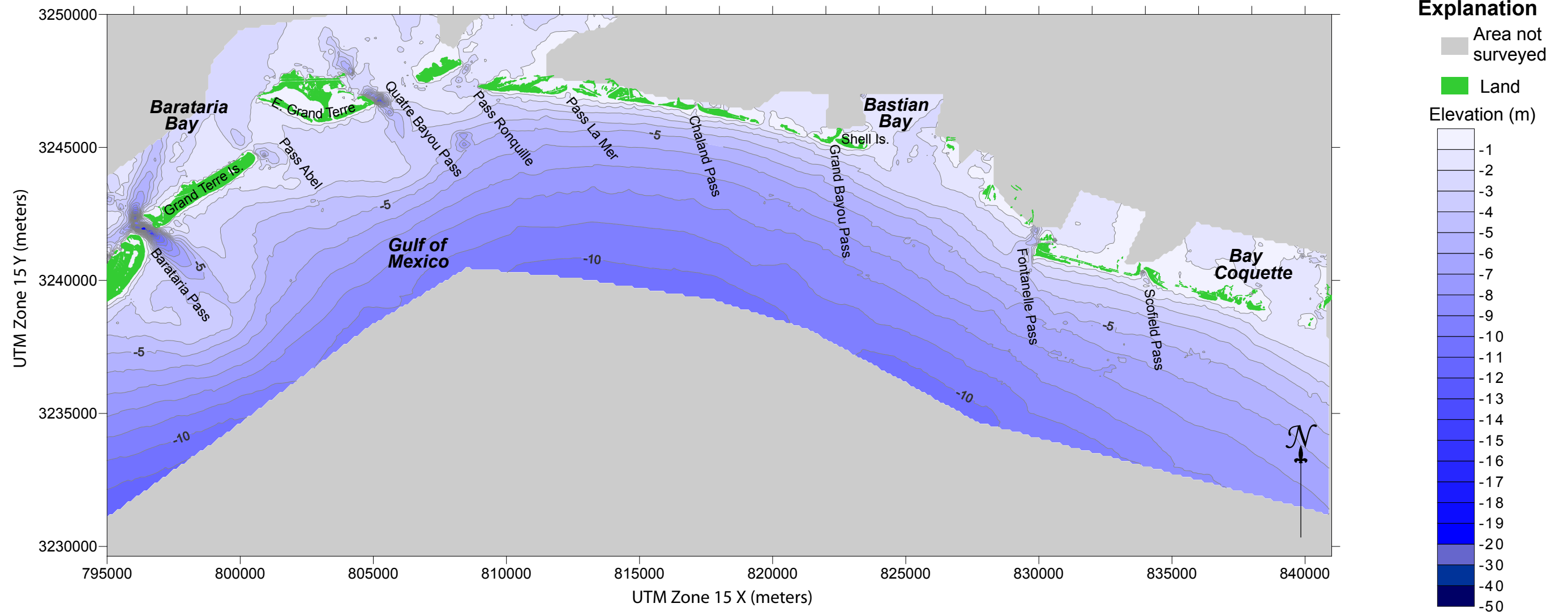


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# Plaquemines Region 2006 Bathymetry



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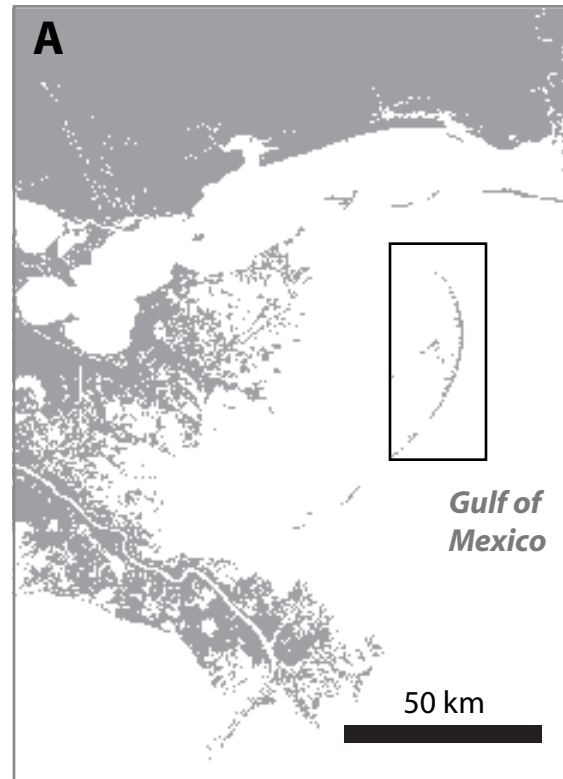
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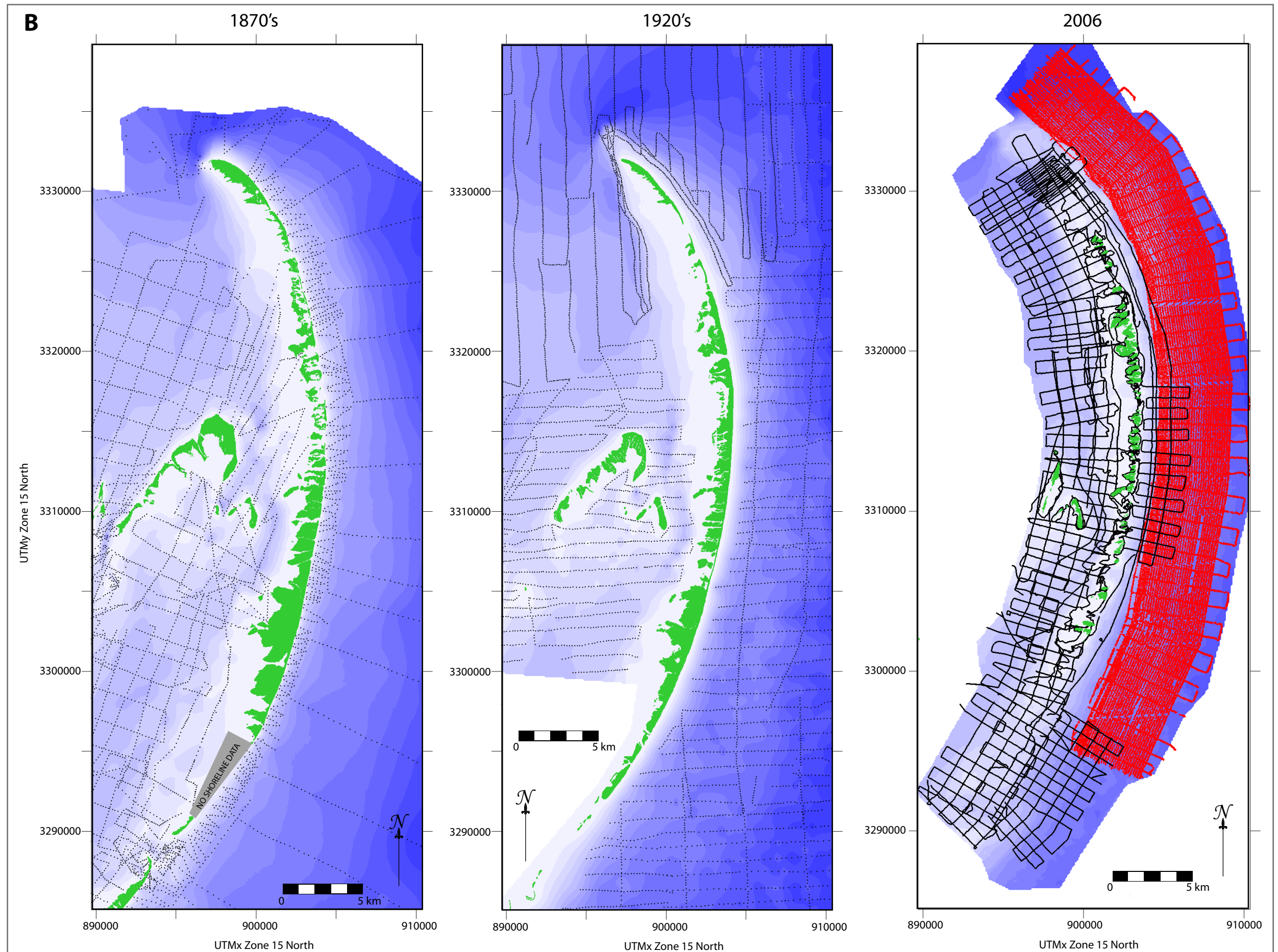


# 1870's to 2006 Bathymetric Survey Coverage: Northern Chandeleur Islands

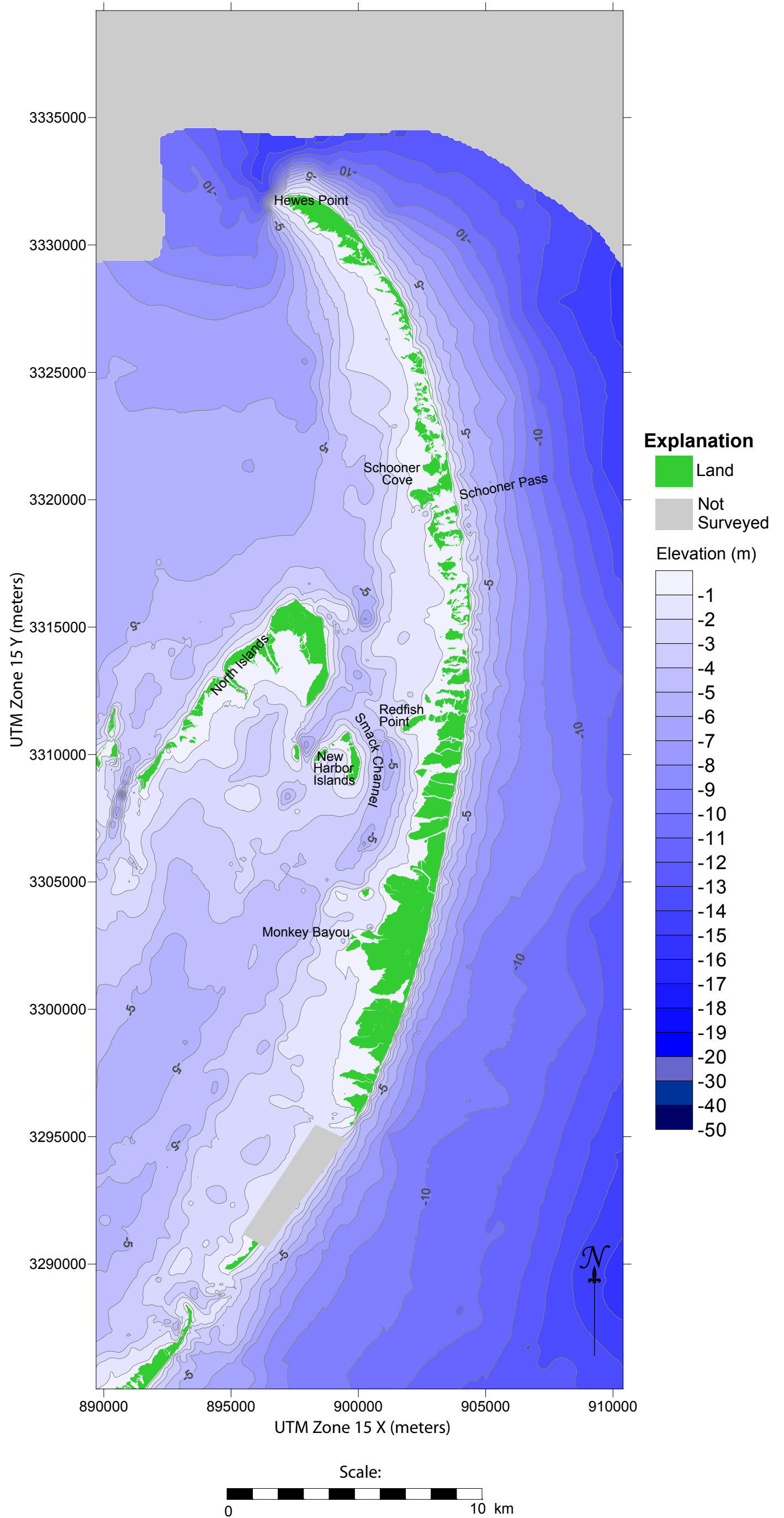


**A.** Regional Map of the modern Mississippi River delta, Lake Borgne and the Chandeleur Islands. The Northern Chandeleur Islands study area is indicated by the rectangle.

**B.** Bathymetric data coverage for the Northern Chandeleur Islands 1870's to 2006. 1870's data points were digitized from U.S. Coast and Geodetic Survey H-Sheets H00999, H01000, H01171, and H01654. 1920's data points were obtained digitally from the National Ocean Service, Coast Survey which were originally from U.S. Coast and Geodetic Survey H-Sheets H04000, H04171, H04212, H04219, and H04223. 2006 data were acquired during bathymetric surveys conducted by the University of New Orleans Pontchartrain Institute for Environmental Sciences and the U.S. Geological Survey. Black transects indicate single-beam and red transects indicate swath bathymetric data coverage. For details on bathymetric data collection and processing see Part 1 of this report. Shorelines from Martinez et al. (2009).



# Northern Chandeleur Islands 1870's Bathymetry



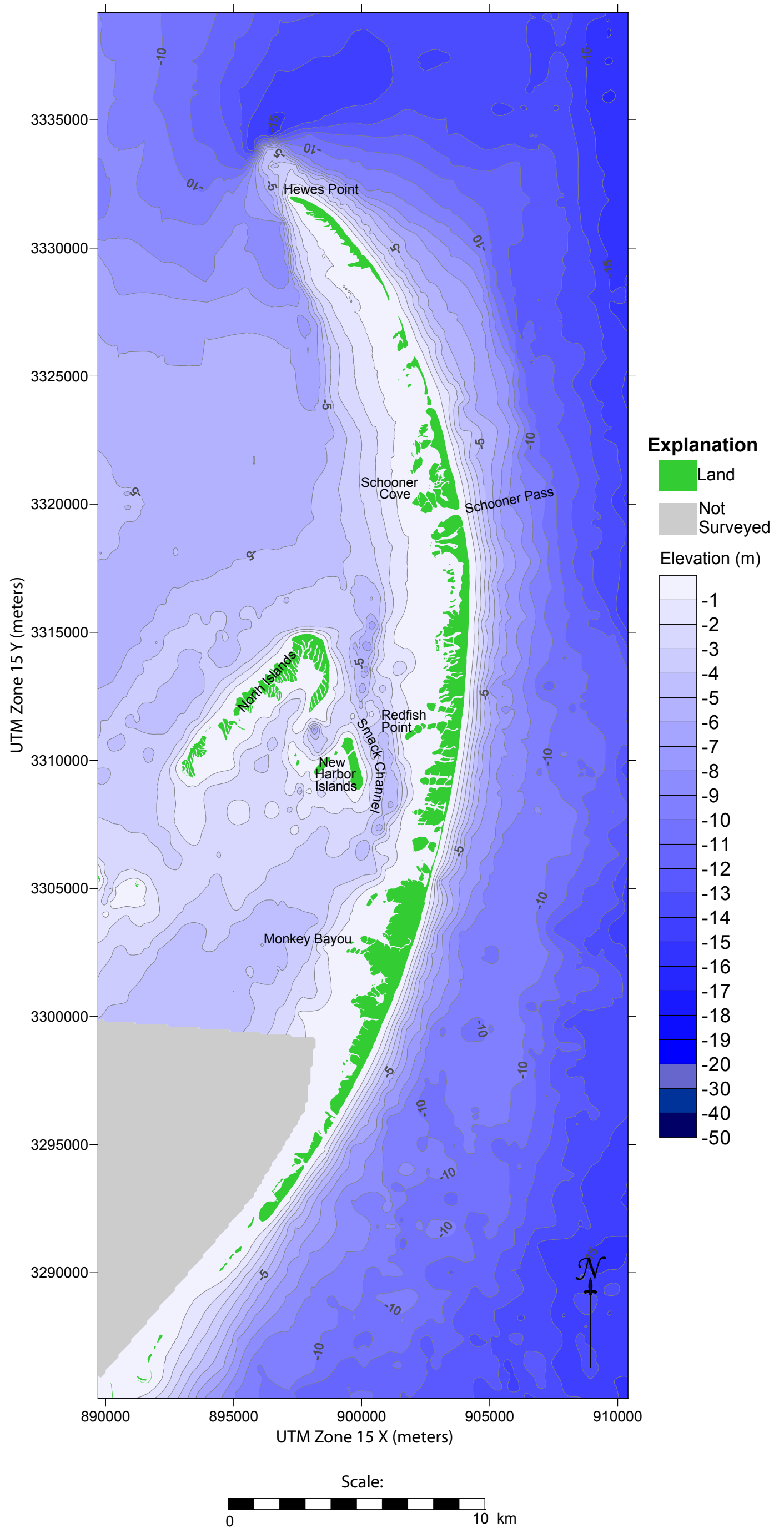
## Bathymetric Data

The bathymetric data on this map was acquired during hydrographic surveys conducted by the USCGS from 1873 and 1885. Depths are given relative to North American Vertical Datum 1988 and were converted from mean low water (MLW) at the time of the survey for comparison to other time periods within a common vertical datum. See details in Part 1 of this report for vertical datum conversion methodology.

## Supratidal Areas

Shoreline data from 1855 were derived from T-Sheets scanned into digital format at a scale of 1:20,000 by UNO-PIES. For details on shoreline processing methodology see Martinez et al. (2009). Note that shorelines were delineated at mean high water for the time of the topographic survey and the bathymetric data is referenced to NAVD88.

# Northern Chandeleur Islands 1920's Bathymetry



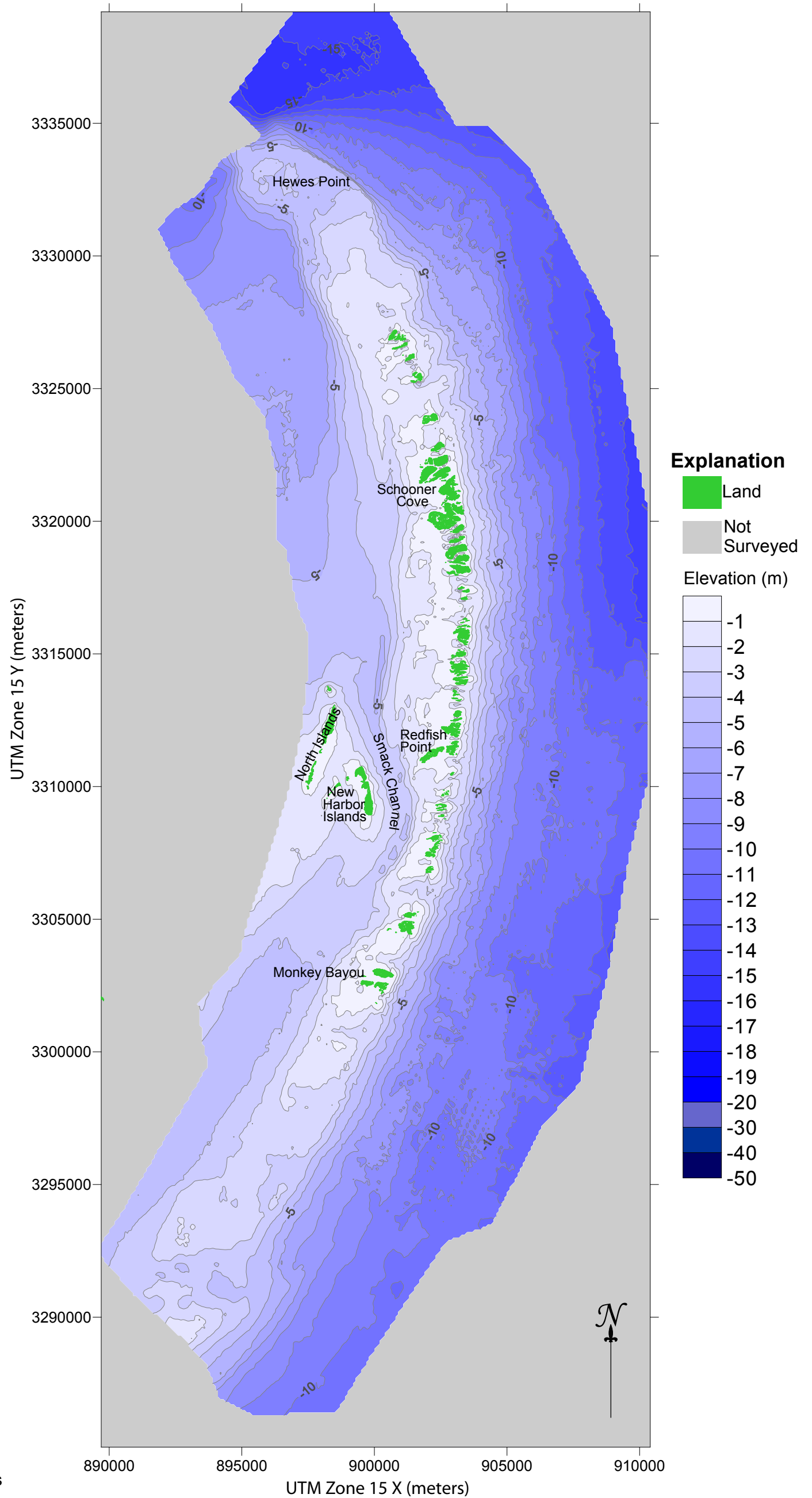
## Bathymetric Data

The bathymetric data on this map was acquired during hydrographic surveys conducted by the USCGS from 1917-1922. Depths are given relative to North American Vertical Datum 1988 and were converted from mean low water (MLW) at the time of the survey for comparison to other time periods within a common vertical datum. See details in Part 1 of this report for vertical datum conversion methodology.

## Supratidal Areas

Shoreline data from 1922 were derived from T-Sheets scanned into digital format at a scale of 1:20,000 by UNO-PIES. For details on shoreline processing methodology see Martinez et al. (2009). Note that shorelines were delineated at mean high water for the time of the survey and the bathymetric data is referenced to NAVD88.

# Northern Chandeleur Islands 2006 Bathymetry



## Bathymetric Data

The bathymetric data on this map was acquired from hydrographic surveys conducted in 2006 by UNO-PIES and USGS. Depths are given relative to North American Vertical Datum 1988 (NAVD88). Not to be used for navigation purposes. See Part 1 of this report for details.

## Supratidal Areas

The areas shown in green were assigned an elevation value of 0.5 meters. Shoreline data from 2005 were derived from a combination of Digital Ortho-Quarter Quads (DOQQs) and Digital Globe Quickbird satellite imagery obtained by UNO-PIES. The shorelines were derived from thematic land/water classifications produced from these image datasets and subsequent GIS editing by UNO-PIES.

Scale:



Vertical datum: NAVD88 (GEOID03 Rev. 10/2006)  
Horizontal datum: North American Datum 1983 (2004.65)

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