Topology and Hydrography of Wax Lake Delta

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The goal of my semester project is to analyze the topology and hydrography of a distributary network; specifically, Wax Lake Delta in Louisiana. Adjustments to the scope of my original project proposal have been made in order to reduce the ambitiousness of the originally-proposed outcomes. Data source identification and some preliminary work in GIS work and statistical analysis have been completed. A summary of completed outcomes is listed below.

- ***Identification of data sources***
  - LANDSAT 4-7 TM imagery and ASTER imagery have been downloaded, but not used in analysis
  - A Bing Maps image basemap was used for hydrographic and topologic analysis of channels, bifurcations, and islands.
  - NHD+ data was downloaded and proved to be unhelpful as the dataset does not extend through the Wax Lake delta network. The lack of available hydrography data has prompted the creation of a flowline dataset for the Wax Lake distributary system.
  - LiDAR data encompassing the entire delta surface was not freely available. However, a colleague in the geology department provided a complete LiDAR survey of the delta from early 2009 (Figure 4). No analysis has been performed using LiDAR data because I just received the dataset Monday, October 24th.
- ***Preliminary analysis using GIS***
  - A flow network has been created for the main channels of the distributary network. Only clearly-defined channels using satellite imagery were included. Figure 1 shows the digitized channel network flowlines.

Figure 1: Wax Lake Delta Flow Network

- The island size distribution of a distributary network is useful in determining the geomorphic processes that characterize the delta's formation. Island edges were traced defining the island edge as the interface between channelized water or ocean water and the land surface. A 1 m resolution was carried through the raster analysis to maintain the integrity of the carefully traced island edges (Figure 2).

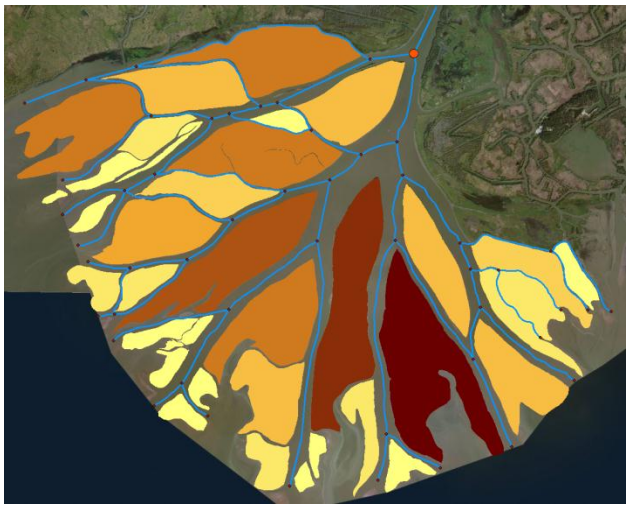

Figure 2: Mapped Islands for Wax Lake Delta

- The nearest-edge distance has also been mapped using the island-size raster (Figure 2) and the Euclidean distance tool. The nearest-edge distance is defined as the nearest distance from a given land-surface location to water. The map can be found here https://webspace.utexas.edu/mrh2778/www/NearEdge.pdf
- A LiDAR survey from early 2009 has been obtained and a hillshade of the dataset is seen in Figure 3. Thanks to John Shaw for providing the data.

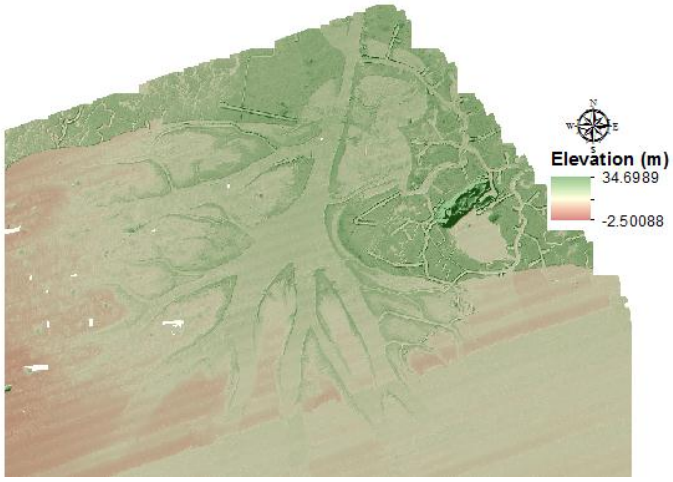

Figure 3: Wax Lake LiDAR

- ***Statistical Analysis of Delta Topology***
    - A statistical analysis using the random-generation model developed by *Smart & Moruzzi* (1972) and expanded upon by *Morisawa* (1985) was performed and compared to the observed topology of the delta network (Figure 1) was completed.
    - The analysis gave a recombination factor α=0.32, suggesting that Wax Lake delta channels tends to bifurcate more than they recombine. The recombination factor can be used to predict topologic characteristics of deltas.
- ***Future Work***
    - The nourishment area of bifurcation points will be mapped and analyzed. The nourishment area is analog to drainage area in drainage networks.
    - An analysis of channel width at interval radial distances from the delta apex may provide some insight into the flow distribution among the network's main channels. A summary of the inflows to the distributary network will be investigated.
    - I will investigate connection between the elevation surface obtained by LiDAR and the topologic properties of the delta to find explanations for depression zones at the center of large islands.
    - Continue analysis on already-determined delta metrics and further statistical work.