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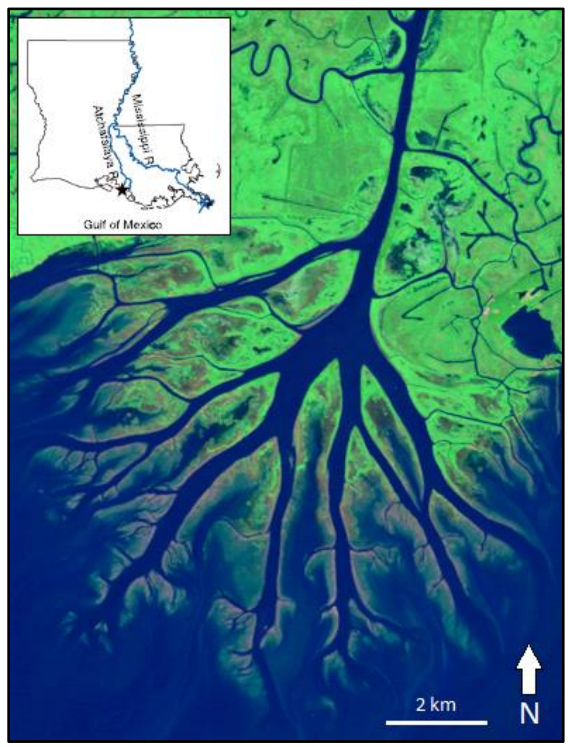
Vegetation Coverage and Change in Wax Lake Delta

GISWR Term Project Update

<u>Introduction and brief description of study site:</u> The Wax Lake Delta (WLD) is a naturally prograding delta on the coast of Louisiana, approximately 200km West of the Mississippi delta. The delta is located at the mouth of the Wax Lake Outlet, an artificial diversion of the Atchafalaya River created by the Army Corps of Engineers in 1941 to alleviate flooding problems in Morgan City (*Carle, 2013*). The WLD has come to be considered a real-world example of the potential land/wetland growth possible via sediment diversion projects, which aim to reconnect fluvial rivers with their sediment-starved floodplains, by removing flow control structures such as levees (*Wagner et al., 2017*). The mechanisms by which deltas build land are complex, but it suspected that vegetation plays an important role in that process, primarily via flow redirection, enhanced deposition, and sediment stabilization (*Corenbilt et al., 2007*). Thus, it is important to quantify the location and extent of vegetation colonization.



<u>Project objective:</u> The present project aims to map vegetation (and vegetation change) within the WLD system. The analysis will do this separately for each of the islands, focusing primarily on Mike and Pintail islands, for several reasons: (1) they are more proximal to the delta apex, and have more emergent vegetation, (2) they are some of the most extensively studied islands within the literature, which means there is a lot of tertiary data that can aid in the analysis.

Two high-resolution Lidar surveys have been conducted in the area, the first in January 2009, and the second in February 2013. These were published previously in *Wagner et al., 2017*, who extracted ground-truth elevations from each of the datasets, and analyzed elevation change throughout the system over the four-year window. This was done by comparing each point to constant-elevation reference landmarks, adjusting elevations to NADV88, forming rasters from the Lidar point-clouds, and finding the difference in elevations between the datasets. Both Lidar surveys were uploaded to OpenTopography (http://www.opentopography.org/) and are freely available (2009: doi:10.5069/G95M63M8; and 2013: doi:10.5069/G9SF2T41). We have already obtained each of these datasets in two forms: (1) the raw point-clouds, which include land cover classes from which vegetation can be directly extracted, and (2) ground-truth raster form, which may prove to be a useful reference during the analysis (e.g. could be used to correlate vegetation coverage to land elevation, for instance). Each of these datasets have been imported into ArcGIS Pro 2.0, but analysis on them has not yet been completed. There are several steps that must be taken before the point-clouds can be properly analyzed, such as the delineation of separate islands, extraction of vegetation features, and possibly the conversion to a raster. To make sure the acquired data was consistent with the analysis done in *Wagner et al., 2017*, their analysis was recreated using geoprocessing tools by taking the difference between the two elevation rasters. The result appears very similar by visual inspection.

In terms of vegetation coverage, the first quantity of interest we will estimate is simply the percentage of the island cells occupied by vegetation. Previous studies have looked at vegetation coverage change throughout WLD, but usually on much broader spatial scales. *Olliver & Edmonds, 2017*, for example, mapped vegetation coverage and temporal change using Landsat images taken from 1984-2016. While their use of Landsat improved their temporal resolution, their spatial resolution was limited to 30m x 30m. The Lidar datasets being used in the present study, however, have a spatial resolution of 4.5 points/m^2 and 12.8 points/m^2 for 2009 and 2013, respectively (*Wagner et al., 2017*). It will be interesting to see to what extent the differing spatial resolution impacts the estimate of vegetation coverage. The level of difficulty in processing the Lidar will determine the amount of time that can be spent analyzing the resulting vegetation features, but some preliminary ideas that would be interesting to study include (1) how vegetation coverage changes in the islands moving from the apex to the distal end of the delta, (2) how vegetation correlates with elevation, and (3) typical shape characteristics (e.g. size, aspect ratio) of vegetation patches in the island interior. This project will inspect, to the best of our ability, each of these findings, and elaborate upon them in the final report.

References:

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