

# Relationships among hydrogeomorphology, wetland distribution, and water levels in estuarine environments

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# Relationships among hydrogeomorphology, wetland distribution, and water levels in estuarine environments

Kyra Prats

## Abstract

Estuaries are dynamic systems characterized by hydrologic mixing, where water, energy, sediment and nutrients from both river and receiving water unite to form a unique yet variable environment. Water levels in estuaries are thus defined by, and subject to, streamflow from the river and sea-level fluctuations. Long-term fluctuations in water levels affect hydrogeomorphic structure, as well as wetland structure, distribution, and composition. This study examined how wetland plant communities in three freshwater estuaries on Lake Michigan have changed through time in relation to long-term changes in lake water level, river discharge, and thus hydrogeomorphic structure. A better understanding of these dynamics will help us to comprehend the processes that govern changes in wetland distribution, and the breadth of the ecosystem services that estuarine wetlands provide.

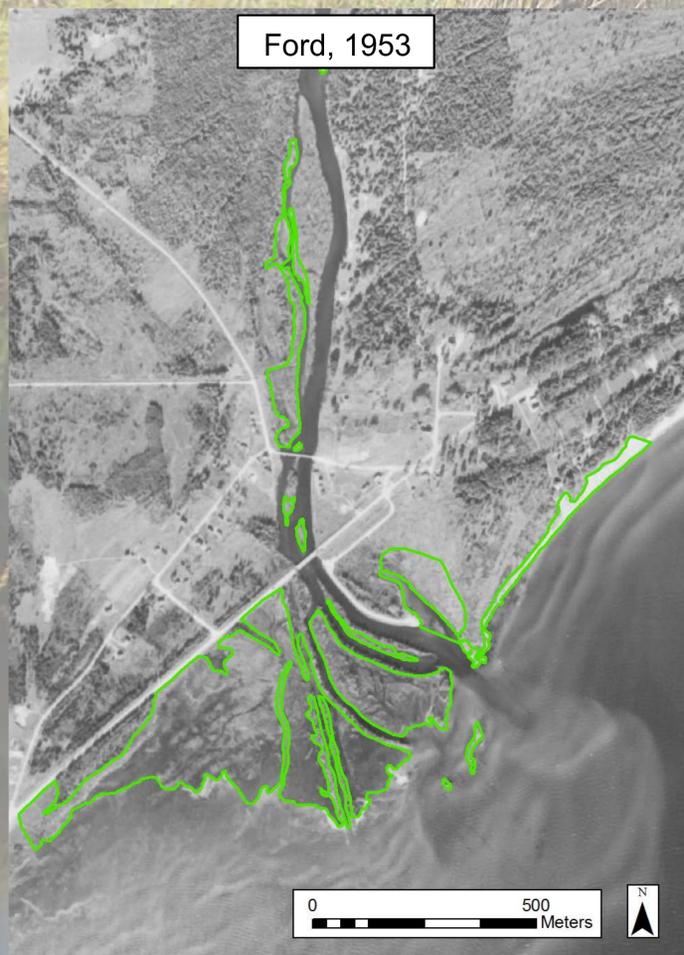


Figure 1. An example GIS map with wetland delineations.



Figure 2. GIS maps of each rivermouth site on Lake Michigan. Wetlands are delineated by the colored lines

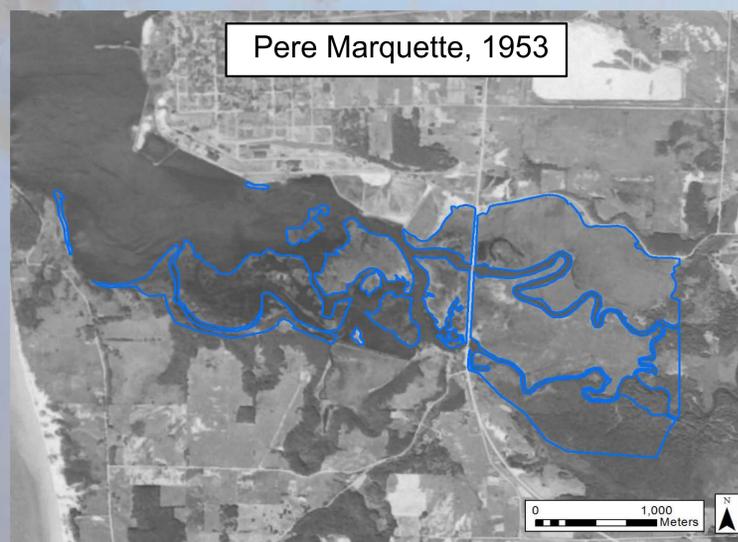


Figure 3. An example GIS map with wetland delineations.

Table 1: Pere Marquette River

Date	Source
7/2/2010	FDA NAIP Imagery
9/15/2005	FDA NAIP Imagery
4/27/1998	USGS EarthExplorer
5/8/1976	USGS EarthExplorer
7/3/1953	USGS EarthExplorer

Table 2: Manitowoc River

Date	Source
4/12/2010	FDA NAIP Imagery
7/25/2005	FDA NAIP Imagery
4/22/1998	USGS EarthExplorer
11/1/1978	USGS EarthExplorer
5/8/1951	USGS EarthExplorer

Table 3: Ford River

Date	Source
7/3/2010	FDA NAIP Imagery
9/15/2005	FDA NAIP Imagery
4/26/1998	USGS EarthExplorer
5/7/1978	USGS EarthExplorer
10/29/1953	USGS EarthExplorer

Figure 4. Historic aerial photographic dates are displayed with their corresponding data source.

## Objectives and ArcGIS Usage

### Objectives:

- Use historic aerial photographs to inform our understanding of how wetland plant communities change over time in estuarine environments.
- Compare wetland distribution with historic Lake Michigan water levels and river discharges in order to understand these biophysical interactions.

### ArcGIS was used in the following ways:

- Orthorectify historic aerial photographs of the rivermouths to display the appropriate geospatial reference.
- Delineate wetland area within each photograph.
- Observe changes in wetland area from year to year.