The following was presented at DMT’09 (May 10-13, 2009).

The contents are provisional and will be superseded by a paper in the DMT’09 Proceedings.

New GIS Tools for Mapping Ohio's Lake Erie Coastal Erosion Areas

Erosion along Ohio’s Lake Erie shoreline is a major geologic hazard. The coastal erosion of large- and small-scale changes. Figures 1 and 2 highlight some large-scale changes. Figure 1 shows an area near Painesville that has undergone changes from 1876 to 1990. Figure 2 shows an area near the Sheldon Marsh barrier island that has undergone changes between 1969 and 1993. The accelerated rate of erosion during that same period (Fig. 2).

Shore-normal coastal erosion rates also erode bluff and extend depression. As a bluff recedes, buildings may be either physically moved back from the bluff or torn down before being destroyed or destroyed from the erosion. In Figures 4a, 4b, and 4d, two houses have disappeared and some owners probably have moved into the garage. Geology, lake levels, prevailing winds, and shore protection affect coastal erosion rates. Between 1973 and 1990, average shoreline recession was 4.14 feet per year. Over the 17-year period, the shoreline receded nearly 24 feet. In certain areas, recesions have occurred at rates up to 54 feet per year (Fig. 4). Ohio’s Lake Erie coastlines experience significantly affects coastal residents.

The State of Ohio mandates that Coastal Erosion Areas (CEAs) be designated for the state’s 262-mile Lake Erie coastline every 10 years. CEA mapping identifies areas threatened by coastal erosion over a thirty-year period. Once CEAs are designated, the CEA program informs at-risk property owners about how to protect their properties. The latest mapping of the CEA involved three steps:

1. Converting the 1998 CEA maps to a GIS.
2. Mapping the 2004 toe of the bluff and the shoreline at each shore-normal transect.

Three newly created applications assisted the 2004 shoreline mapping and calculated coastline recession: a shore-normal transect identification number application, a CEA 2004 digitizing application, and a CEA Calculator application. The three applications facilitated the task of remapping the CEA and reduced mapping time from more than one year to less than 3 months.

Before work could be performed on the new CEA delineation, identification numbers had to be assigned to all shore-normal transects. These new, or TID, are contiguous and have a spatially-sequential orientation. TIDs need to have such orientation because a five-point moving average algorithm is used to analyze shoreline trends.

To assign TIDs, staff members track the fact that the 1990 aerial photograph was flown east-to-west along the coast and assigned the speed to each west-to-east along the coast and assigned a contiguous number to each aerial photo. During 1998 CEA mapping, shore-normal transects were drawn on each 1990 aerial photo. These transects were uniquely numbered for each photo; the number is comprised of a five-letter code that indicates the location of the transect. The new CEA delineation uses the unique TID numbers for the entire coastal dataset.

By 2004, the two houses (circled) have been lost to coastal erosion. Property owners probably had moved into the garage. Geology, lake levels, prevailing winds, and shore protection affect coastal erosion rates. Between 1973 and 1990, average shoreline recession was 4.14 feet per year. Over the 17-year period, the shoreline receded nearly 24 feet. In certain areas, recesions have occurred at rates up to 54 feet per year (Fig. 4).

A portion of the coastline near the Pennsylvania border. The outlines of two 1990 aerial photo frames are labeled in GREEN. The new TID numbers are labeled in YELLOW. To assign TIDs, staff members track the fact that the 1990 aerial photograph was flown east-to-west along the coast and assigned a contiguous number to each aerial photo. The new TID numbers are labeled at each shoreline extent. The new TID numbers are labeled in YELLOW. To assign TIDs, staff members track the fact that the 1990 aerial photograph was flown east-to-west along the coast and assigned a contiguous number to each aerial photo. The new TID numbers are labeled at each shoreline extent. The new TID numbers are labeled in YELLOW.