Temporal Analysis of Urbanization around Barnegat Bay, NJ 1985-2011

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Remote Sensing in Environmental Analysis

GGY 422/522, Spring 2011

Introduction

Barnegat Bay is a 30 mile long estuary that is bordered by Ocean County to west and Long Beach Island to the east. Since it's early development in the 1940's, the area surrounding this embayment has grown immensely, now providing home to over 580,000 residents. Such rapid growth has lead to a massive increase in development, at the expense of the valuable vegetation of the area. The purpose of this study was to investigate and model the relatively rapid change from vegetative areas (forests/marshes) to urban areas in this Barnegat Bay area of Southeastern New Jersey.

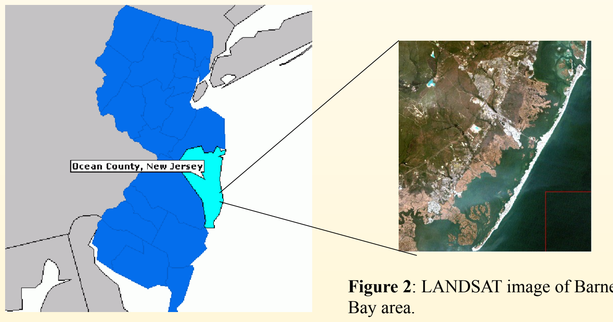

Figure 1: Animation of Ocean County New Jersey

Figure 2: LANDSAT image of Barnegat Bay area.

Study Area

This study focused on lands in Ocean County, New Jersey, including Manahawkin, Stafford Township, Little Egg Harbor, and Long Beach Island; all of which are centered around Barnegat Bay. The following images are the LANDSAT TM (4-5) that were used in image classification

Figure 3. 1985 false color image of Barnegat Bay, NJ

Figure 4. 2011 false color image of Barnegat Bay, NJ

Methodology

Using GLOVIS, LANDSAT 4-5 TM images of Ocean County, NJ in April 1985 and April 2011 were downloaded. An unsupervised classification (k-means) was used on each image with 10 classes and 20 iterations each. Like classes were combined into one of three categories: Water, Vegetation, or Urban. Accuracy of the unsupervised classifications was determined by using ground truth ROIs in a confusion matrix. Visual interpretation was performed by exporting the unsupervised and combined 1985 image and overlaying it with the urban class from the unsupervised/combined 2011 image.

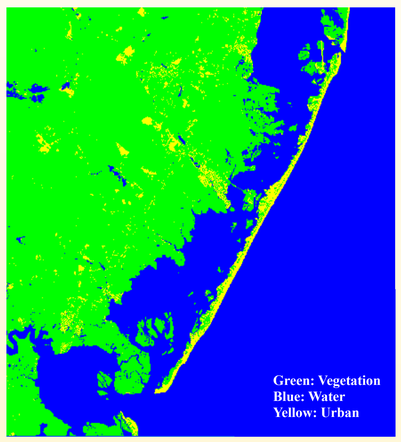

Figure 5: Barnegat Bay, New Jersey—1985 (classified and combined)

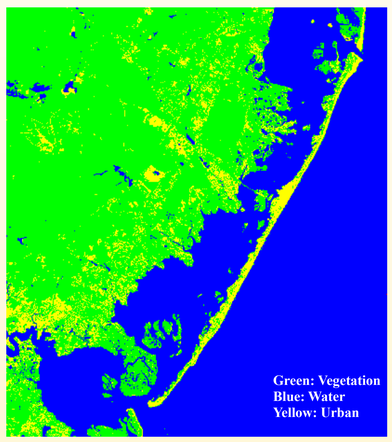

Figure 6: Barnegat Bay New Jersey—2011 (classified and combined)

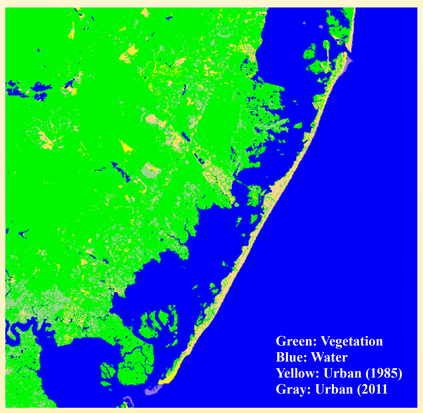

Figure 7: 1985 (classified and combined) with 2011 urban class overlaid (transparency = 20%)

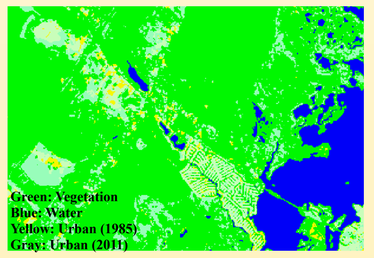

Figure 8: Zoom in on 1985 (classified and combined) with 2011 urban class overlaid (transparency

Results:

Change analysis detection revealed that between April of 1985 and April of 2011 24.72 square kilometers of vegetation was lost, and 22.57 square kilometers of urban area was formed. This is a 57.37% increase in urban area– which if rates of urbanization were constant throughout the 16 year span– would correlate with 3.59% (1.41 square kilometers) growth per year. Vegetation decreased by 4.49% (1.55 square kilometers), which correlates with a drop of 0.28% per year. The accuracies of the classified images using ground truth ROIs were 98.3% for the 1985 image and 97.4% for the 2011 image.

Table 1: Area of land cover classes (kilometers squared).

	Water	Vegetation	Urban
1985	689.72	551.09	39.34
2011	691.87	526.37	61.91
Change	2.15	-24.72	22.57

Acknowledgements:

The author would like to thank Samuel Woolard and Dr. Eman Ghoneim for their help and support throughout the entire process of this project.

Data Source:

USGS GLOBAL VISUALIZATION VIEWER (GLOVIS — http://glovis.usgs.gov/

References:

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