

# Final Project: Lidar Shoreline Study

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GEOG 497D: Lidar Technology and Applications (Spring 2010)

# Project Overview

- Problem Description
- Study Area
- Data Documentation
- Analysis Documentation
- Results
- References

# Problem Description

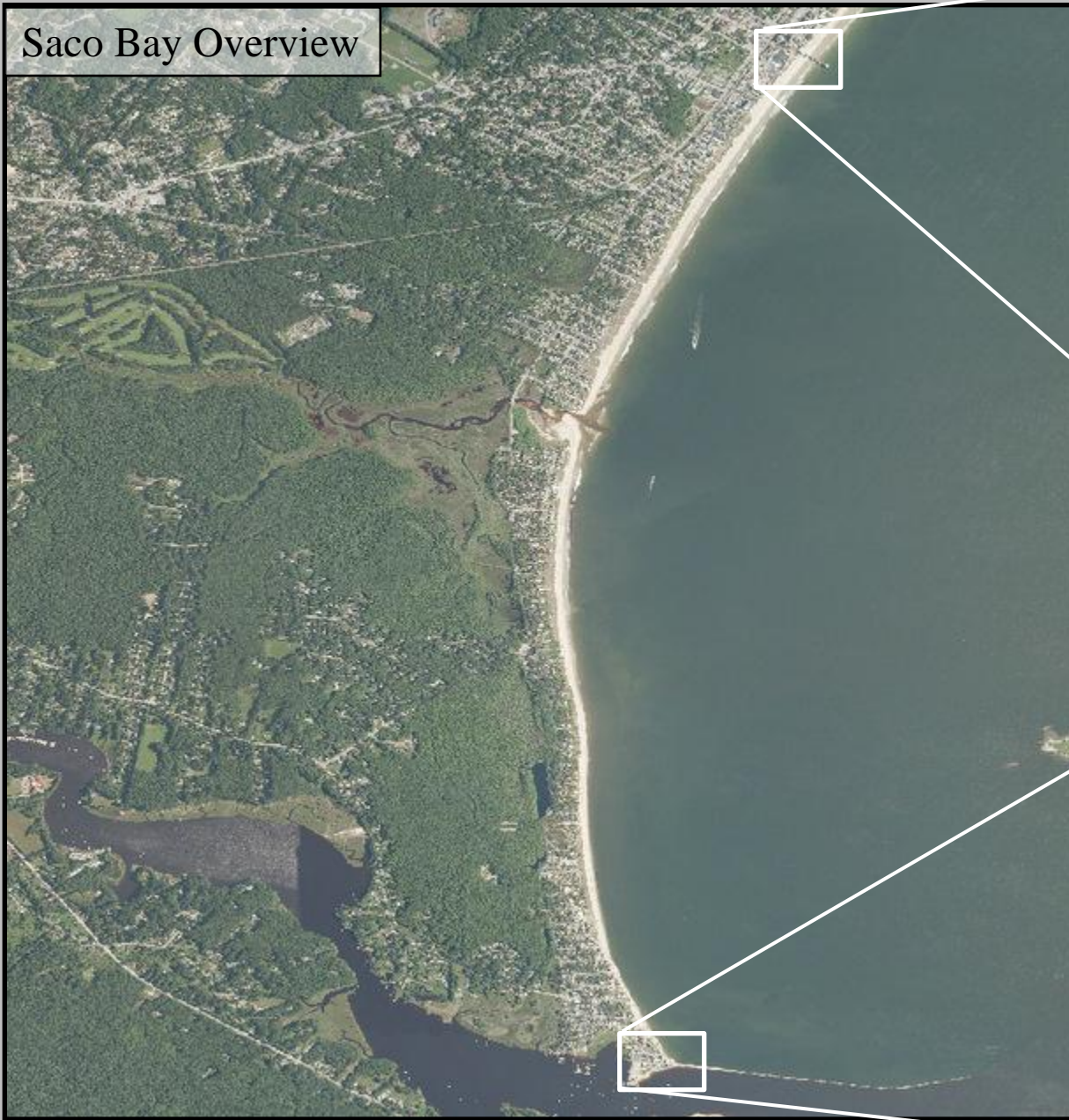
- The Maine coastline is long and beautiful, but many of the sandy beaches are eroding away. Spots are eroding enough that Maine has established a beach scoring system for the management of the sandy shoreline. Their initial study utilized historical beach data in addition to their new scoring system. The system uses residents to make manual measurements, which is time consuming and relies on volunteers. This project intends to use publicly available remote sensing lidar data to measure the historic shoreline change by documenting the front of the dune system.

# Study Area

- Saco Bay, Maine



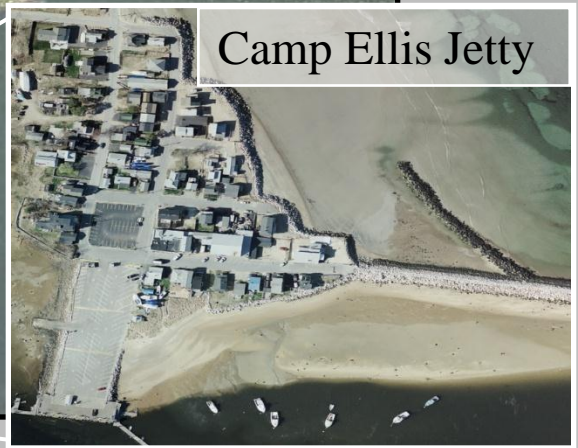
# Saco Bay Overview



## Old Orchard Pier



## Camp Ellis Jetty

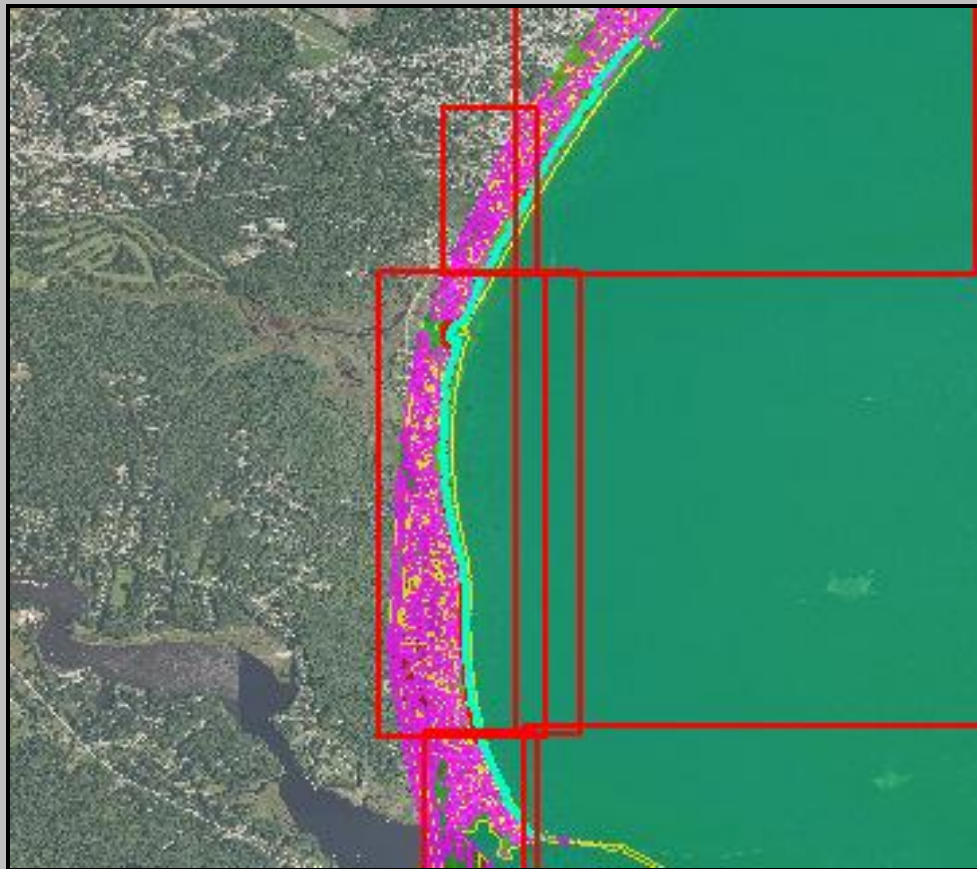


# Data Documentation

- [Digital Coast](#) - NOAA Coastal Services Center
  - 2000 Fall East Coast LiDAR collected by the Airborne LiDAR Assessment of Coastal Erosion (ALACE) Project
    - **Vertical accuracy:** Believed to have a root mean square error of 15 centimeters for bare ground.
    - **Horizontal accuracy:** 80 centimeter root mean square error.
    - **Nominal Ground Spacing:** 3.0 meters
    - **Ancillary Mission Information:** Imagery
    - **Data Classes Available:** First return
    - [Metadata](#)

# Data Documentation

- 2000 Fall East Coast LiDAR collected by the Airborne LiDAR Assessment of Coastal Erosion (ALACE) Project



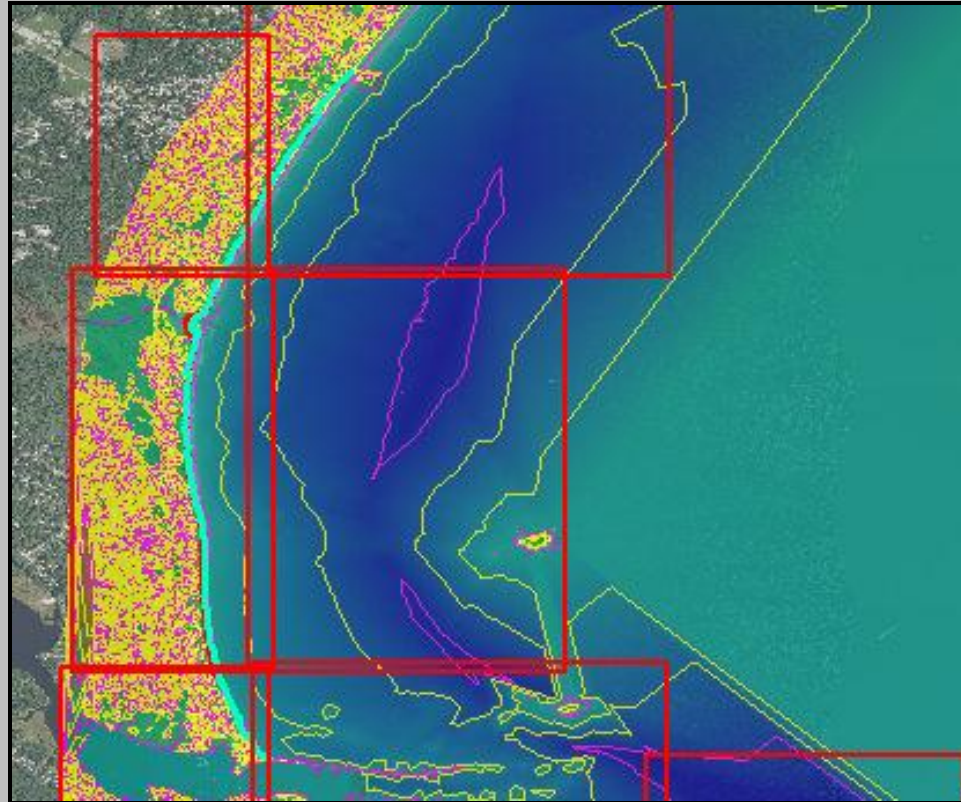
# Data Documentation

- [Digital Coast](#) - NOAA Coastal Services Center
  - 2007 USACE New England Topo/Bathy LiDAR collected by the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX)
    - **Vertical accuracy:** vertical accuracy of the data exceeds 0.20 m at 1 sigma.
    - **Horizontal accuracy:** horizontal accuracy of the data exceeds 0.75 m at 1 sigma.
    - **Nominal Ground Spacing:** 2.0 meters
    - **Ancillary Mission Information:** Passive
    - **Data Classes Available:** First return
    - [Metadata](#)



# Data Documentation

- 2007 USACE New England Topo/Bathy LiDAR collected by the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX)



# Data Documentation

- [Maine GeoLibrary](#)

- Maine Orthoimagery

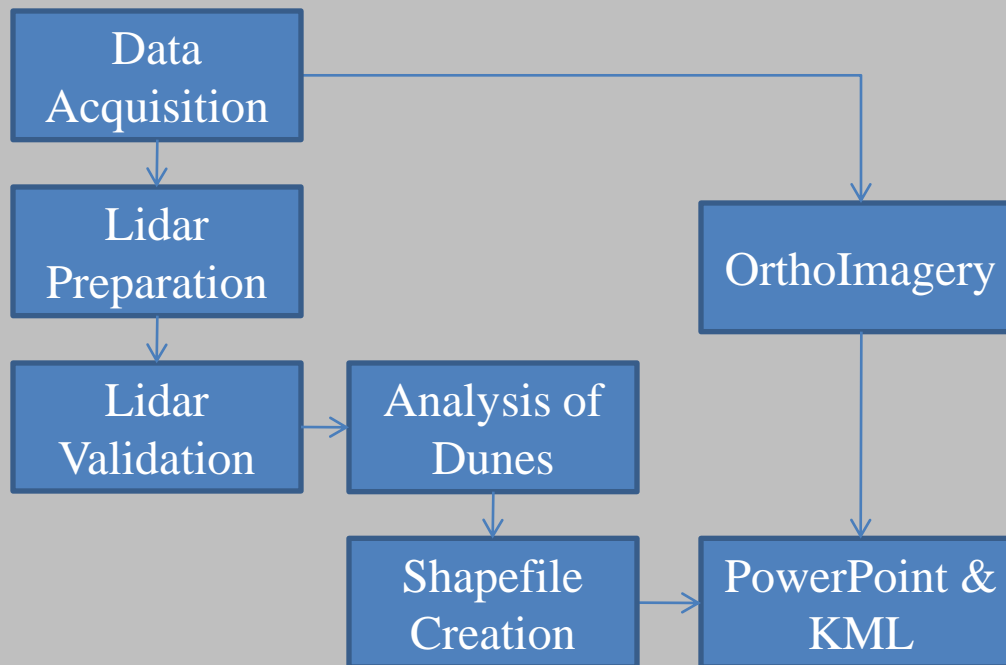
- **Data Type:** WMS Service
    - **WMS Server:**

- <http://mapserver.maine.gov/wms/mapserv.exe?map=c:/wms/orthos.map&>

- **Service Name:** Maine\_orthos
      - **Geographic Coordinate System:** GCS\_WGS\_1984
      - **Datum:** D\_WGS\_1984
      - **Prime Meridian:** Greenwich
      - **Angular Unit:** Degree

# Analysis Documentation

- Workflow



# Analysis Documentation

- Data Acquisition
  - Used [Digital Coast Viewer](#) to search and download lidar data layers. Viewer allows user to prepare data and download all files contained within a single zip file. Downloaded 2007 lidar data in LAS 1.1 format and 2000 lidar data in raw ASCII XYZ comma delimited files.

# Analysis Documentation

- Orthoimagery
  - Obtained by using a WMS service to avoid downloading large imagery files. Added WMS Server to ArcMap.

# Analysis Documentation

- Lidar Preparation
  - Lidar data was downloaded with the NAD\_1983\_StatePlane\_Maine\_East\_FIPS\_1801\_Feet coordinate system. Added 2007 lidar data to ArcMap using the LP360 extension. The 2000 lidar data needed to be imported and then converted to \*.las files, also using the LP360 extension. Transformed data to GCS\_WGS\_1984 to overlay with orthoimagery. Each lidar data layer was set to Display by Elevation, Draw TIN, Contours On, Transparency 40%.

# Analysis Documentation

- Lidar Validation
  - Lidar data was overlaid with orthoimagery to make sure the data was in the correct location. Both datasets contained first returns, so there was no need to filter. There were also no Model Keypoints contained in the data.

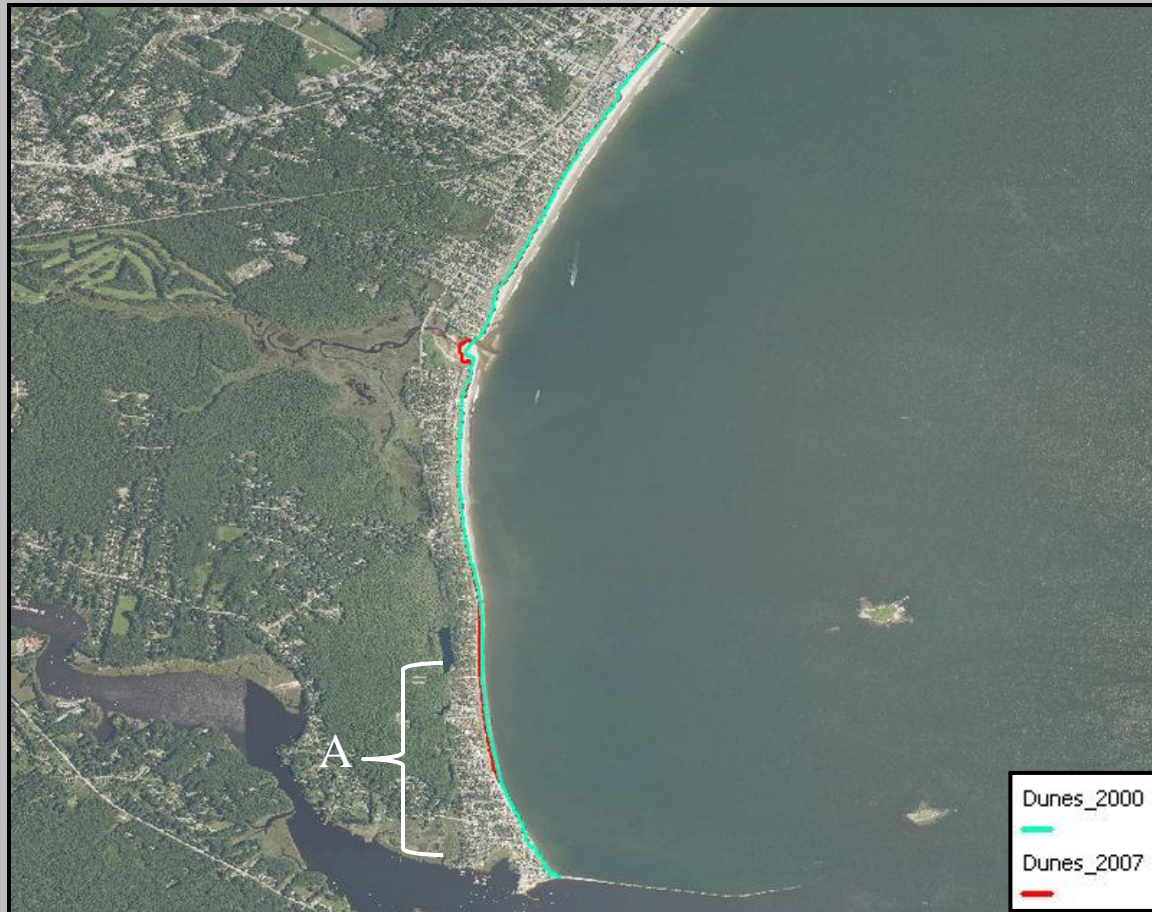
# Analysis Documentation

- Analysis of Dunes
  - Checked lidar data against similar time period orthoimagery. There were some discrepancies in the data, most likely due to the lower accuracy of the orthoimagery.
  - Using the Draw function in ArcMap, a line was created where the dune ends for each dataset. Using Convert Graphics to Features, line shapefiles were created.
  - Shapefiles were compared against each other to see if there was erosion.
  - Shapefiles were exported using Layer to KML.



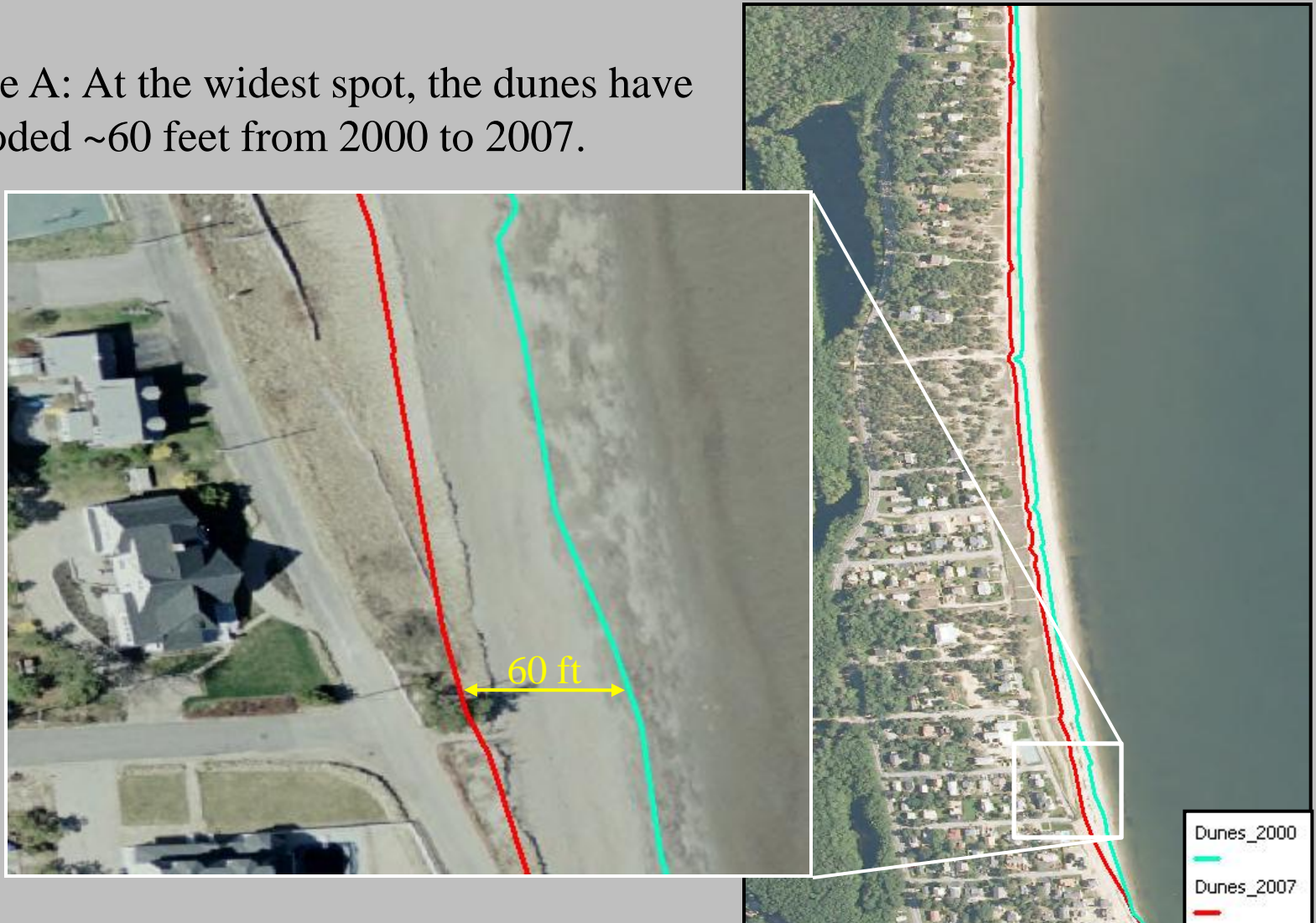
# Results

- When zoomed out to the overview, the dune lines are very close together, but there is one spot where the 2007 line stands out from the 2000.



# Results

- Site A: At the widest spot, the dunes have eroded ~60 feet from 2000 to 2007.



# Results

- Summary
  - Pitfalls
    - Large Data – decided against downloading orthoimagery due to size.
    - Large Area Of Interest (AOI) – cut down the size of the AOI and discarded the 2004 lidar data set due to time consumption of creating dune lines.
  - It is possible to use lidar data to map dune erosion along the Maine coastline.
  - This could negate the need for volunteers, although at a higher cost for collection.
  - Results were easy to produce in KML format for public consumption.

# References

- State of Maine's Beaches in 2007,  
<http://www.maine.gov/doc/nrimc/mgs/explore/marine/beaches/ferry.htm>