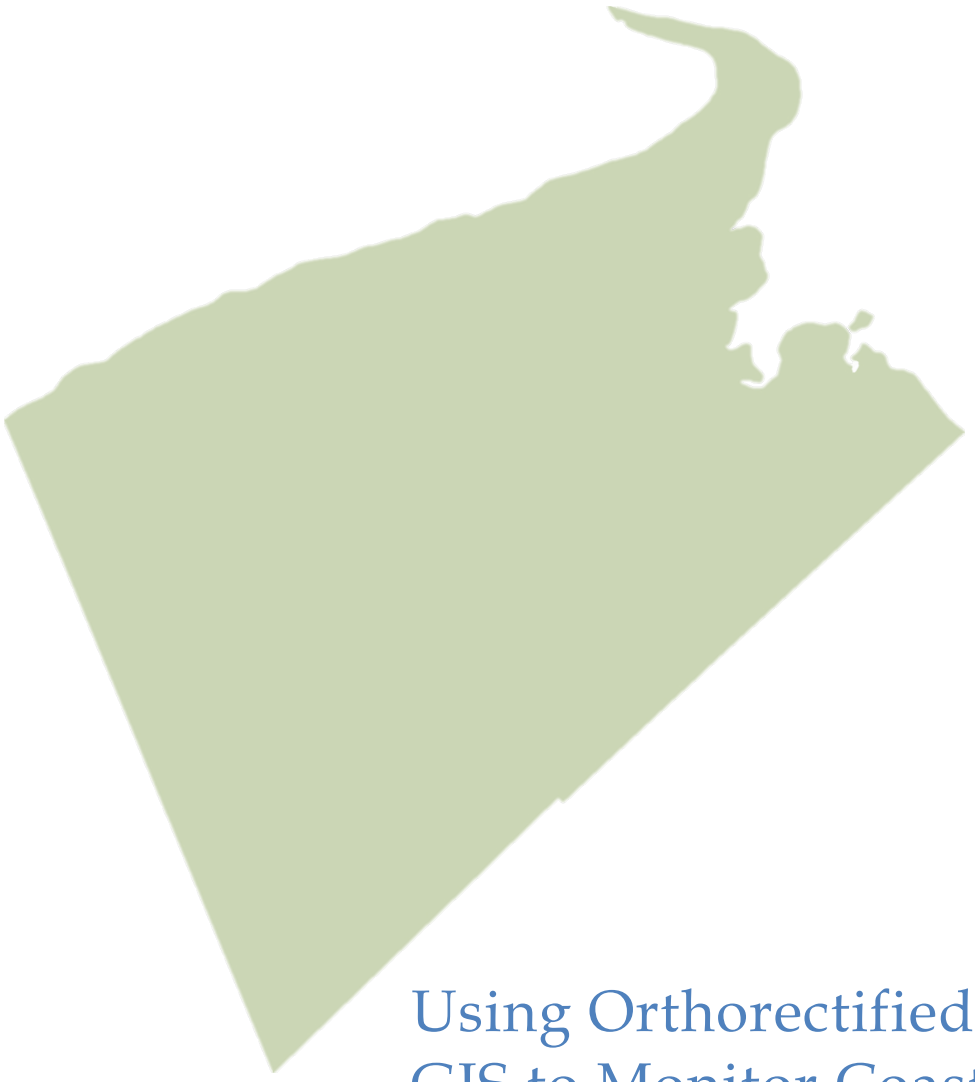

Using Orthorectified Imagery and GIS to Monitor Coastline Erosion

Kings County, Nova Scotia

KIRSTEN HARRISON
COEP 3050
ED SYMONS

COGS | nscc

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BACKGROUND

The beautiful, picturesque Kings County, that many residents call home, is a gem of Nova Scotia. With Nova Scotia being mostly surrounded by water, the 6 700 kilometre-long coastline is an important area that we need to ensure is protected.

According to National Geographic, the Global Mean Sea Level has risen by 4 to 8 inches over the past century, though looking at the past two decades; the annual rate of rise has been 0.13 inches per year, about twice the average speed of the previous 80 years (National Geographic).

Coastal Erosion is an issue for all coastal countries, provinces, states and the like. By digitizing the shoreline over the past 50 or more years, using satellite imagery or aerial photography, we can assess the current erosion rate. Models can help us to approximately predict the future rate of erosion; this will give a visual representation of the issue at hand.

With the knowledge that we can gain from this report, Kings County can protect areas along the coast that have severe erosion rates, so that no development will be permitted and development that has occurred can be better protected.

CLIENTS

For this research project, I will be partnering with the GIS technicians from the Municipality of the County of Kings. For the duration of this project my advisors from the Municipal office will be as followed:

Adam Barnett
GIS Technician
Municipality of the County of Kings
87 Cornwallis Street,
Kentville, Nova Scotia
(902) 690-2218
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Monica Beaton
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Adam Barnett will be the full time advisor for the duration of the research project and Monica Beaton will be an advisor through the preliminary process. As well as the client, many contacts have been considered as well for information incase if any issues arise. These contacts are as followed,

- **David Poole,** Planning Technician, Municipality of the County of Kings
- **Dr. Tim Webster,** B.Sc., M.Sc., Ph.D., Research Scientist with Applied Geomatics Research Group
- **Garett Gaudet,** Summer Student Researcher, Applied Geomatics Research Group

GOALS

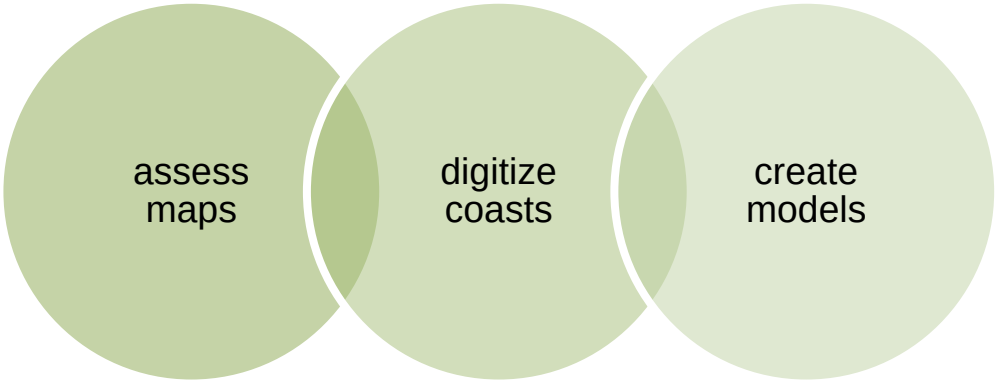
Important data and maps of Kings County that I intend to design and create while researching are soils maps, slope maps and erodibility maps. These maps will aid in selecting the study areas and also play a role as references and guidelines for when it comes time to complete the whole Kings County coastline.

Using aerial photography, I plan on digitizing the coastline from the available imagery as far back as I can go, possibly 50 years. Using the digitized coastlines, I will be able to assess a rate of erosion for every year and see if it is a steady increase or whether the rate is abruptly increasing and to what amount. Though, one thing that must be taken into consideration is that it may not be a constant rate of erosion but a rate of formation. In areas in the Minas Basin, the clay earth has built up over the years to create an increased coastline.

For the deliverables, I will produce a model, showing what the coastline would look like in 2050 and 2100. Unfortunately, I still have not found a program that will allow me to do this, though I will continue to look until I find one. A model of the coastline in 50+ years from now would be a fantastic asset to the project. Many people are visual learners and do not understand the consequences until they can see them, this will provide a visual aid if it is needed.

As well as a model, I will be providing an overview of what Coastal Erosion Management Plans that other countries, provinces, states and the like have adopted to aid in their coastal planning decision making. This will give the client an idea of what management plans are currently being used and can possibly adopt for the Municipality of the County of Kings.

When I have completed this research project for COEP 3050, I intend to be familiarized with the issues surrounding coastal erosion and prevention as well as familiar with creating prediction models using available free or inexpensive software.



TASK LIST

In order to complete this research project a series of tasks must be completed and analyzed to ensure a reliable end result is achieved. These tasks include[1],

- Create a Gantt chart
- Select areas of interest
  - Primary – Morden & Grand Pré
  - Secondary – Kingsport & Blue Beach
- Set up meetings with client
- Obtain a project outline from AGRG
- Research and obtain more information about DSAS and other modeling programs
  - Create models for 2050 and 2100
- Georeference air photos
  - Find air photos (COGS, AGRG, GeoNOVA, NAPL, Kings County)
  - Scan air photos
  - Orthorectify
  - Adjust ortho
  - Mosaicking orthorectified air photos
  - Digitizing all coastlines
    - Compare coastlines over the years and calculate a rate of erosion
- Obtain soils and slope data
  - Create soils, slope and erodibility maps
  - Compare maps to the rate of erosion
- Figure out errors
  - Spatial resolution inconsistencies, relief displacement, inconsistent data, storms, global warming, sea level rise, etc.)
- Survey Grand Pré
  - Kings County Survey Technician, Theresa Smith
  - Send letters out to residents to inform about the survey
- Research other "areas" Coastal Management Plans
  - Create overview or similar for Kings to potentially follow
- Use census and civic address point file to approximate the number of residents within a certain distance of the coastline in each area of interest.

[1] These tasks are subject to change

ISSUES

- Whereas the research project has not yet gotten underway, it is difficult to predetermine where issues may arise. From previous knowledge I can assume that the process will not go completely smooth and there will be bumps and hiccups in the road.
- I will need to obtain Aerial Photography or Satellite Imagery from Kings County and the Centre of Geographic Sciences (COGS) archived files of Kings County. This imagery may not be completely ready for digitization and may not even be in a digital format. If this happens I will need to use a large format scanner which both NSCC COGS and the Municipality of the County of Kings have readily available.
- There may not be complete sets of aerial photographs for the same year, for each of the study areas, therefore the rate of erosion may change.
- When digitizing the aerial photography, it may be difficult to determine the coastline because of relief displacement in some areas; therefore this will create a grey area in the data integrity.
- The dykes in Grand Pré will create issues because they are used to prevent erosion.
- In my research, I will also have to find or design a program that I would be able to use to predict and produce a model of my areas of interest for Kings County. This will be difficult because the program that I will eventually be using must be free or inexpensive. I will have to collaborate with other users and ensure that the program of choice will be useful enough to purchase.

RESULTS

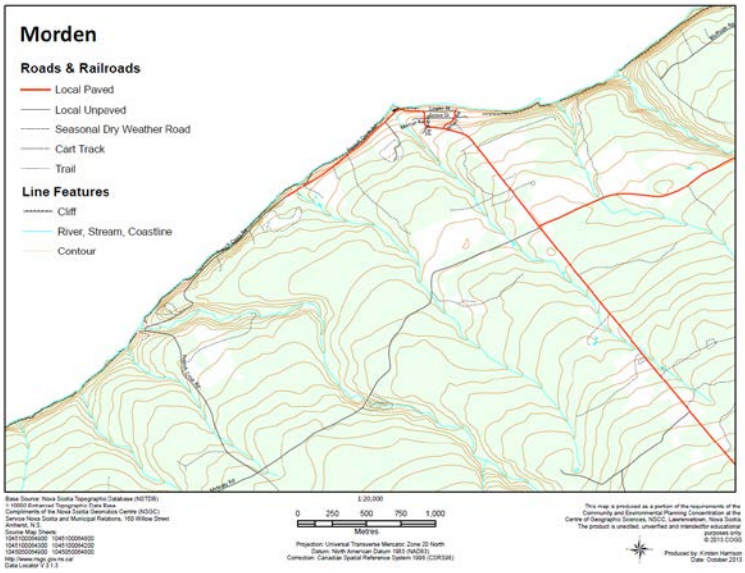
The results of my research project for COEP 3050 will be as followed:

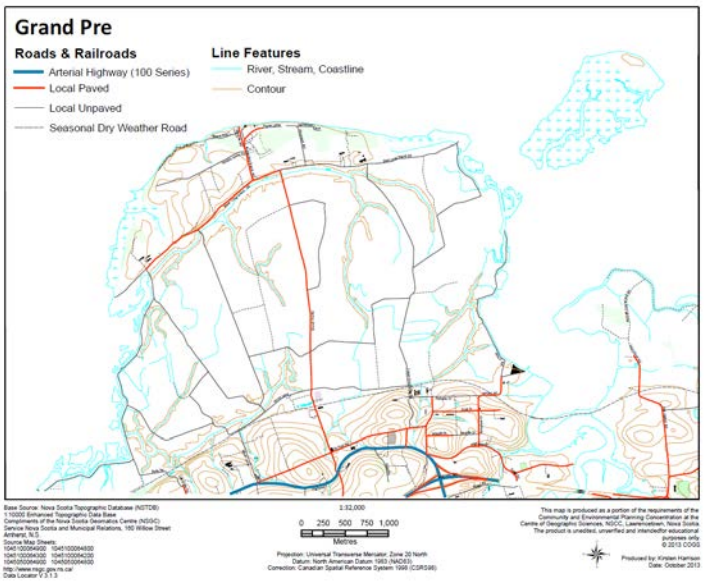
- A thorough technical report, explaining each step of the process. This will be useful so that when the client intends to complete the rest of the coastline area, it will be a clear explanation of how to replicate the work that I have done.
- A series of models of the "Areas of Interest" which will be created by using free or inexpensive software.
- An overview of a possible Coastal Erosion Management Plans that could be adopted by the Municipality of the County of Kings. This management plan will include information from Prince Edward Island, Hawaii, Australia and other Provinces, Countries, States and the like, and what issues are more important and what could possibly be done to aid the stress of eroding coastlines.

All of the above will be complied in a digital and hard copy submission for both NSCC COGS and The Municipality of the County of Kings.

STUDY AREA MAP

The Kings County region is the location that I have chosen for this research project. The coastline of Kings County spans approximately 140 kilometres, therefore only certain areas will be done for this research project. Morden, along the west coast of Kings County was selected for one of the Areas of Interest because of its rocky coastline. It was said that the French Cross in Morden was moved many years ago because of the erosion of the coastline. The integrity of that statement is still being researched and validated.





Grand Pré was chosen because of the sandy and clay coastline that surrounds the location. In 2012 the Landscape of Grand Pré became Canada's 16th UNESCO World Heritage Site, with this title there were stipulations that the coastline must be monitored for erosion to aid in the protection of this World Heritage Site.

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