Charles Creek Flood Zone Modeling:

A Correlation Study of Environmental Conditions Versus Water Level in the Pasquotank Watershed

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Overview

- Motivation
- Abstract
- Research Questions
- Methodology
  - Materials
  - Initial Setup
  - Procedures
- Problems/Solutions
- Data Analysis
- Conclusion
- Future Work

Motivation

Abstract

- **The Charles Creek area in Elizabeth City, NC experiences frequent flood conditions seemingly unrelated to rain fall amounts. The purpose of this study was to compare barometric pressure, lunar cycles, wind directions and wind speeds with water depth readings of Charles Creek (a tributary of the Pasquotank River). A static remote imaging system was used to measure water depth through pixel enumeration and referencing through remote sensing techniques coupled with custom image processing software. Envirnomental data was collected through Elizabeth City State University's National Renewable Energy Laboratory Weather Monitoring Station. The data was correlated using MINITAB® to find an equation that approximated the model of the rise of the creek's water level based upon environmental conditions. The regression equation had a coefficient of determination of 42%; this means that there was a 42% probability that the model was useful at predicting the pixel count based on environmental variables.**

Research Questions

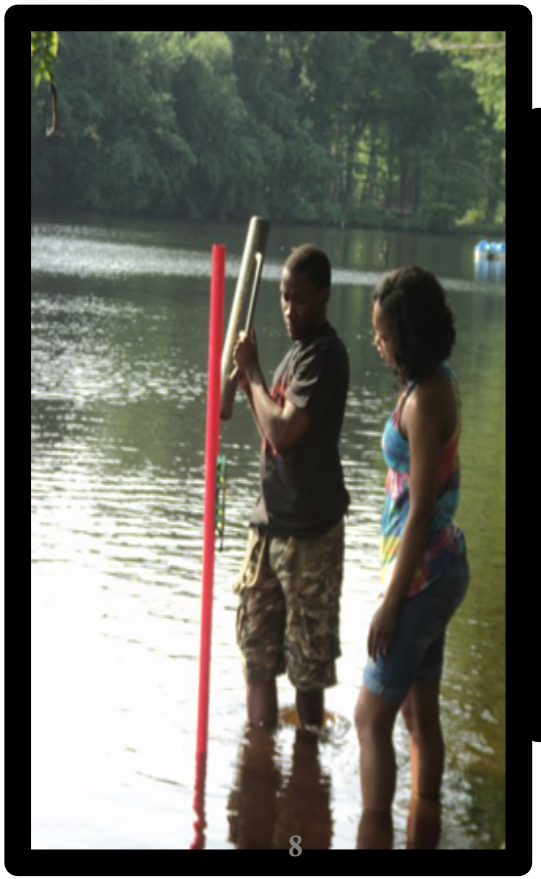
- Does barometric pressure have a correlative relationship with the Charles Creek water level?
- Which environmental variable had a greater effect on the Charles Creek water level?
- Can a visual method be used to capture images in order to measure water levels in Charles Creek?
- What is the equation that can model the interaction between the water level and environmental variables?

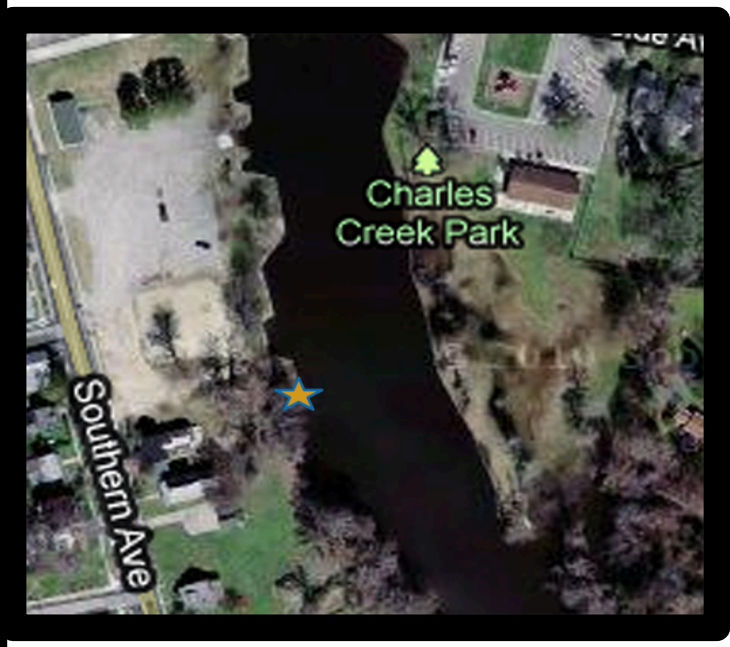
Methodology: Materials

- Hardware
  - Laptop
  - Creative® Webcam Model
  - Tripp-Lite ® Battery
  - 7ft Pole
  - Standard Tape Measure
- Software
  - Dropbox®
  - Google Docs®
  - Minitab®
  - ENVI®
  - Chronolapse

Methodology: Initial Setup

- Installation
  - June 8, 2011
  - North 36° 17.678’
  - West 76° 13.042’
- 10.248 m From Imaging System to pole
  - -7 ft below sea level
- Ubuntu Linux
  - Camorama





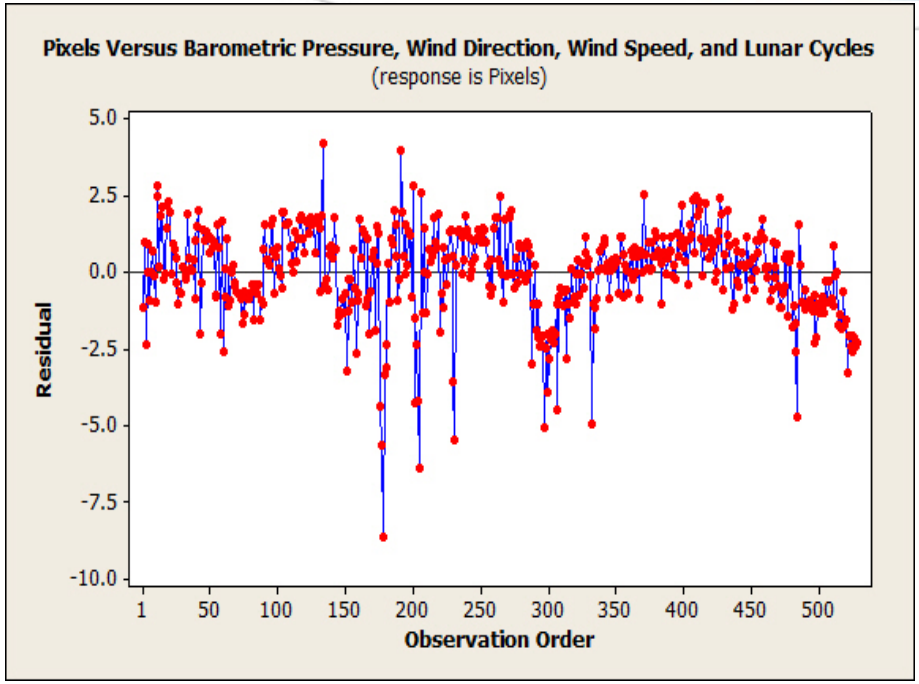
Methodology: Procedures

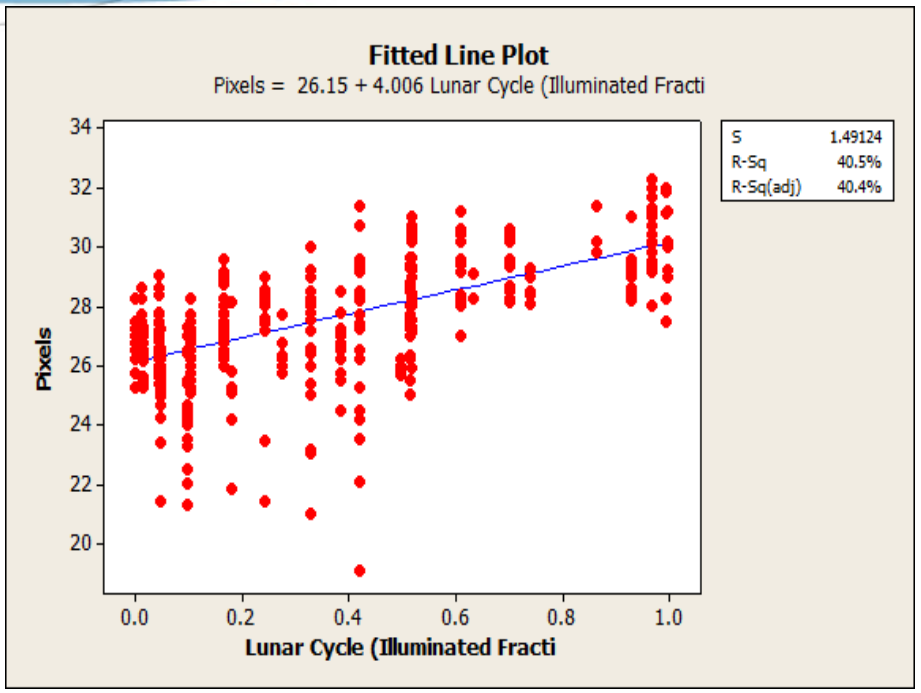
- Insitu Process
- Epoch Script
- Google Docs ®
- ENVI ®
- ECSU Weather Station
  - Brian Casey Artifact Page

Problems / Solutions

- Bad/Poor Imagery
- Camorama
- Chronolapse
- Matlab ®
- MiniTab ®

Results: Data Analysis





Pixels=33.5-0.0067*(Barometric Pressure) - 0.00194*(Wind Direction)-0.122*(Wind Speed)+4.29*(Lunar Cycle)

Conclusion

- The barometric pressure placed inside of the model created by the flood zone modeling team showed a R-squared value of 2.5% that indicated that it had very little correlative relation with the Charles Creek water level.

- Further more the data analysis did show that the lunar cycle variable, individually, placed in the model showed greater effect on the water level of Charles Creek than others. It had a R-squared value of 40.5%.

- Finally a visual method was proven to be helpful to capture images in order to measure the water levels in Charles Creek and facilitate the teams procedures and derive a meaningful model from the data analysis.The equation that modeled the interaction between the water level and environmental variables was **Pixels=33.5-0.0067*(Barometric Pressure) - 0.00194*(Wind Direction)-0.122*(Wind Speed)+4.29*(Lunar Cycle)**

Future Research

- Automated Image Processing Program
- Night Lighting
- Cloud Based Image Storage System
- Pressure Gauge

Questions?

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