

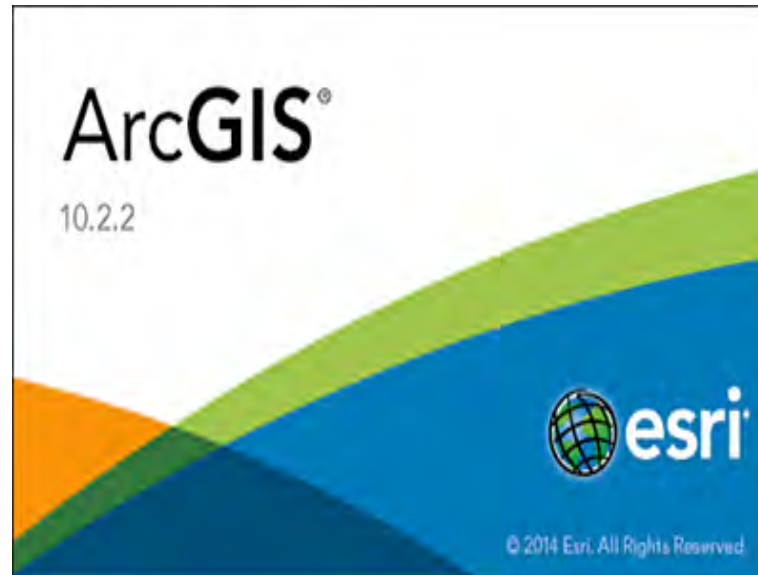
Using NDVI to Understand Vegetation Changes Within the Knox Preserve, Stonington, CT

By: Jenna Wilborne

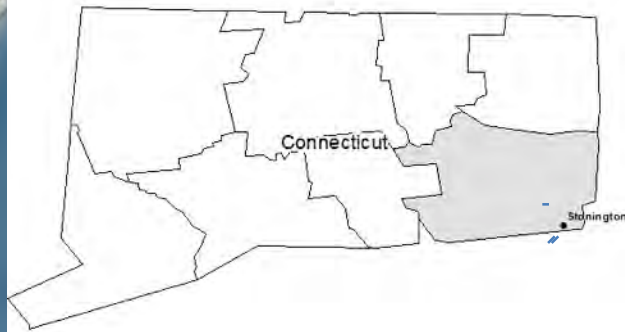
Senior Project

Research Professor: Cameron Douglass

ENVS 401 – Senior Seminar



Site Description: Knox Preserve - Avalonia Land Conservancy



Invasive Vine Species & Bird Populations

- (Invasive Vine Species)



- (Invasive Shrub Species)



- (Bird Species)



Red-winged
blackbird



Yellow-rumped
warbler

Bird Banding Net Locations 1990-2013, Knox Preserve, Mystic, CT



Map by: Cassandra Cronin'17

Methods

- 3 Step Process

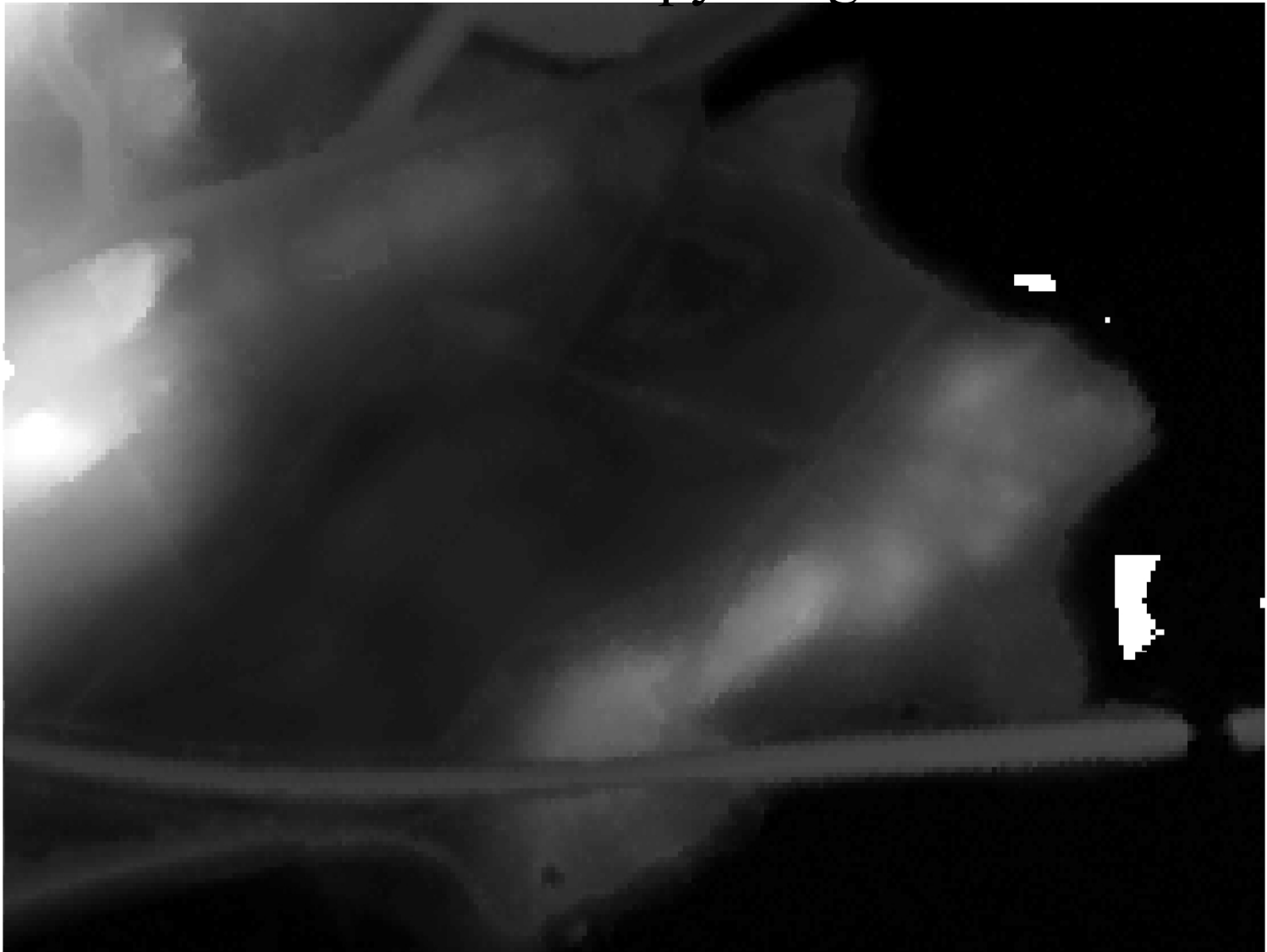
Methods 1: Lidar Analyses (**Unsuccessful**)

Methods 2: Landsat Imagery Analyses (**Unsuccessful**)

Methods 3: NDVI Analysis of Ortho-imagery (**Success!**)

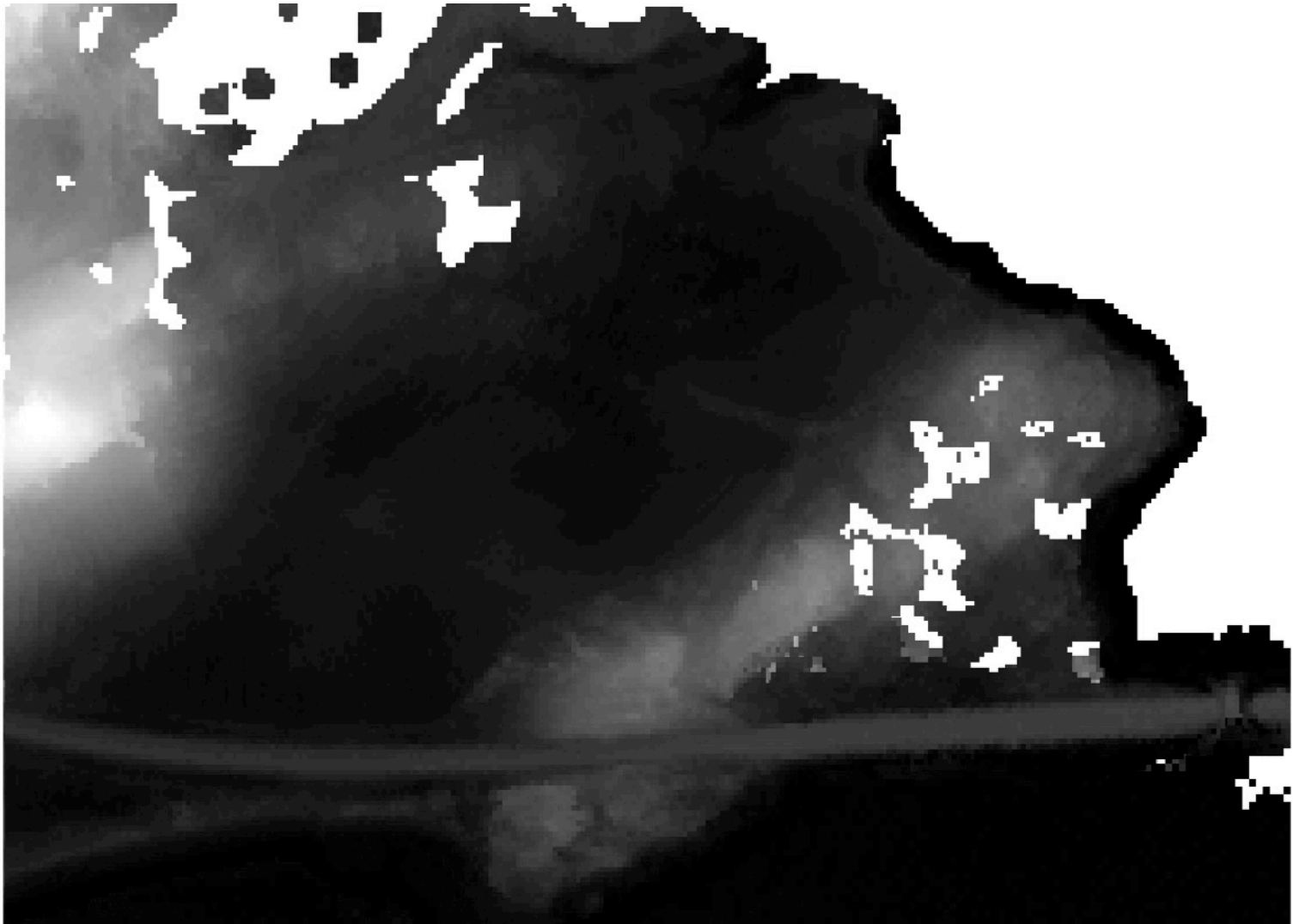


Methods 1: Using Lidar Data to Understand Changes in Forest Canopy Heights



*2006 Digital Coast Lidar Data: Knox Preserve

Bad Lidar Data



*2010 Digital Coast Lidar Data: Knox Preserve

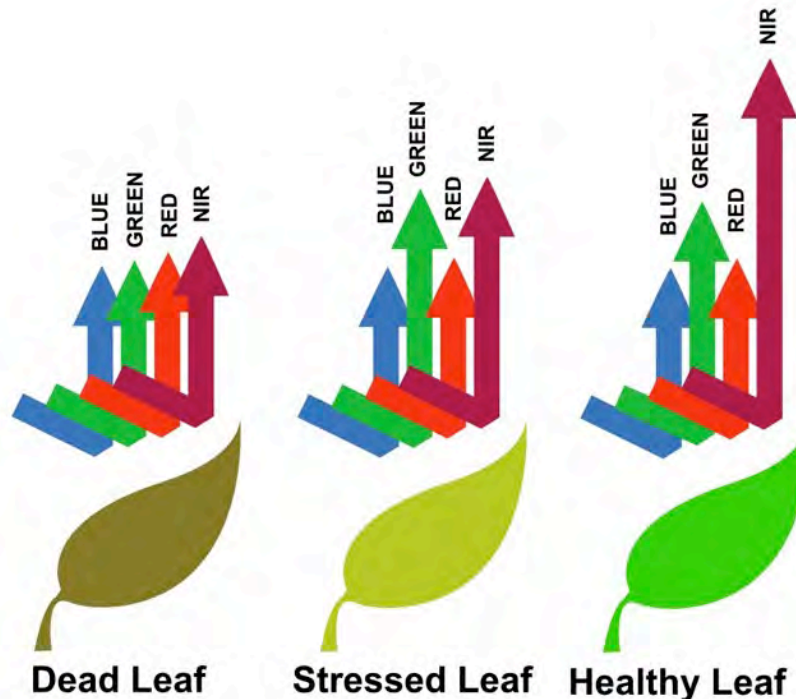
Methods 2: Using Landsat Imagery to Understand Changes in Forest Canopy

- Advantages
 - Multiple Bands
 - Greater Raster Manipulation
 - Better Results

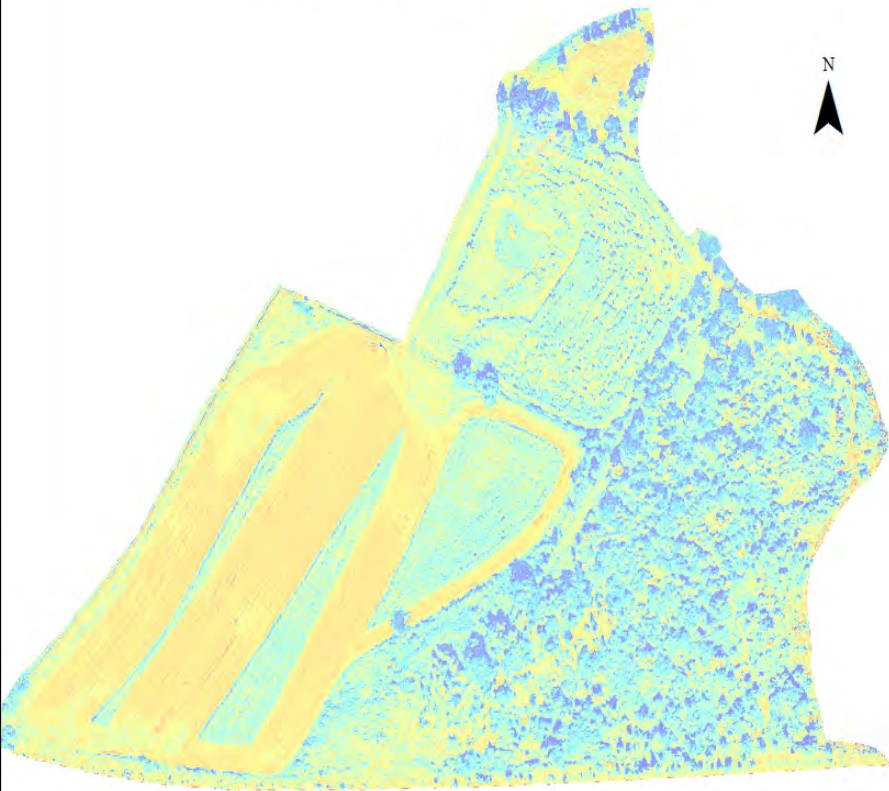
- Disadvantages
 - Not useful at a small scale

Methods 3: Using NDVI Analyses in Understand Changes in the Vegetation

- Normalized Difference Vegetation Index
 - The differential reflection in the red and infrared (IR) bands enables you to monitor density and intensity of green vegetation growth using the spectral reflectivity of solar radiation
 - Spatial Analyst Tool Extension Raster Calculator
 - **Equation Used: $NDVI = \frac{(IR - R)}{(IR + R)}$**
 - » *IR = pixel values from the infrared band
 - » *R = pixel values from the red band



2004 NDVI Knox Preserve, Stonington CT



0 0.025 0.05 0.1 Kilometers

Legend

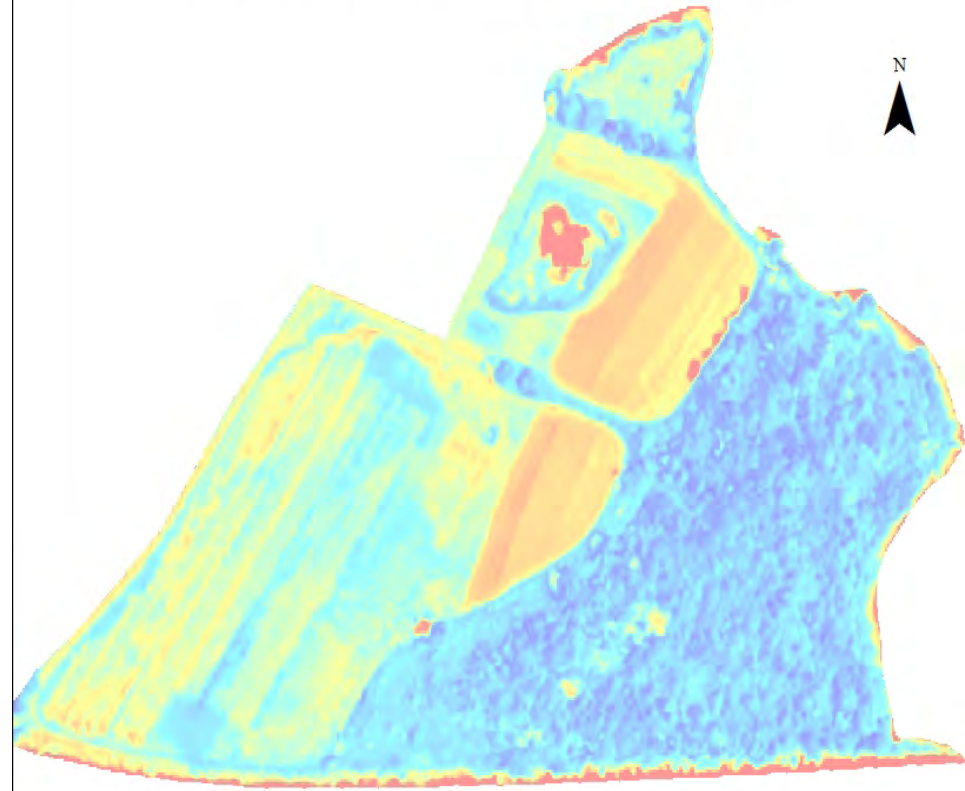
NDVI2004

Res: 1 : 1.442
Cell size: 0.720

Value



2008 NDVI Knox Preserve, Stonington CT



0 0.025 0.05 0.1 Kilometers

Legend

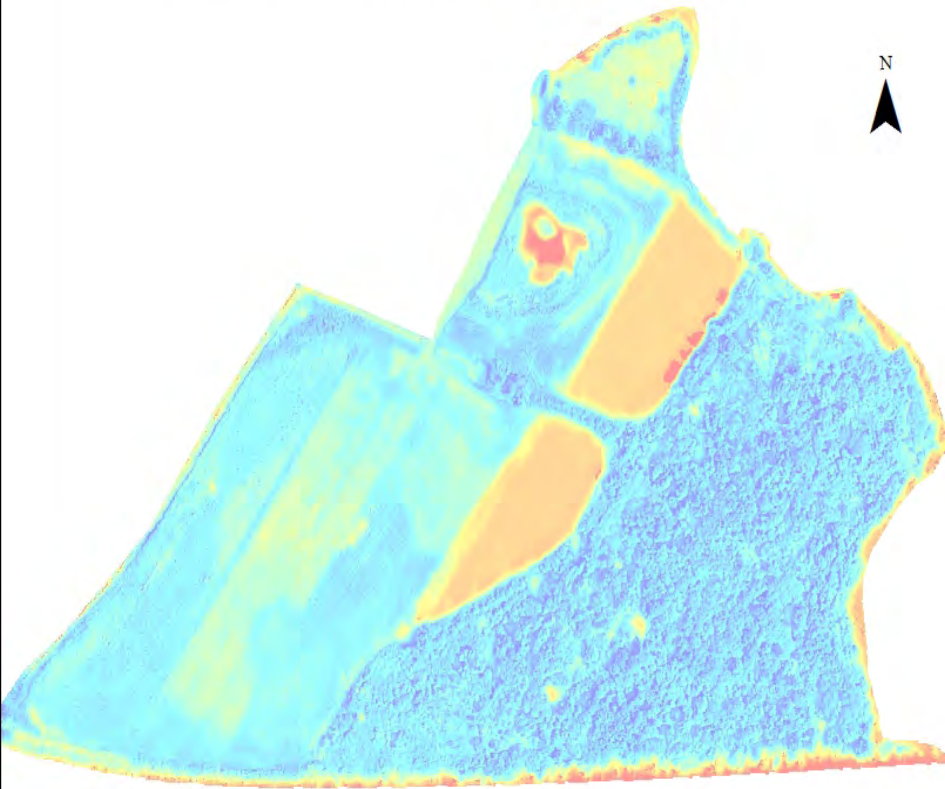
NDVI2008

Res: 1 : 0.722
Cell size: 0.720

Value



2010 NDVI Knox Preserve, Stonington CT



0 0.025 0.05 0.1 Kilometers

Legend

NDVI2010

Res: 1 : 233037.845

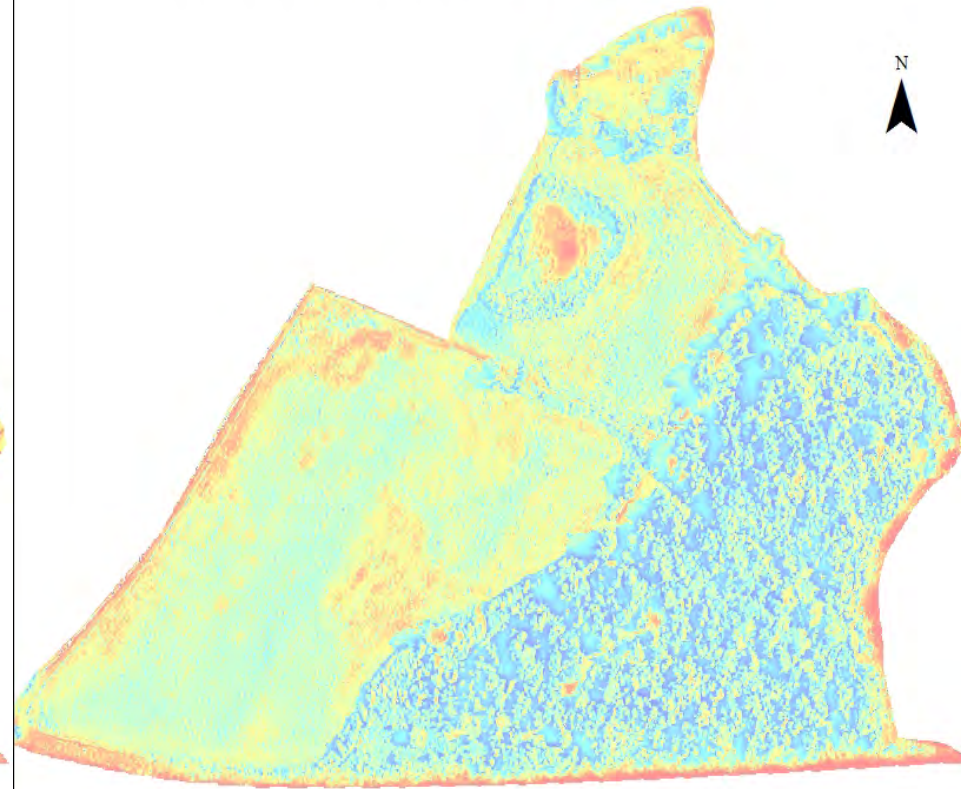
Cell size: 0.720

Value

High : 0.923695

Low : -1

2012 NDVI Knox Preserve, Stonington CT



0 0.025 0.05 0.1 Kilometers

Legend

NDVI2012

Res: 1 : 139351.775

Cell size: 0.720

Value

High : 1

Low : -1

Zonal Statistics

- Calculates statistics (e.g. mean, range, stdev.) on values of a raster within the zones of another dataset. (ArcGIS)



- Zone 1: ForestedAreas
- Zone 2: Grasslands
- Zone 3: Wetlands
- Zone 4: Entire Site

Vegetation Changes Within the Knox Preserve: 2004-2012

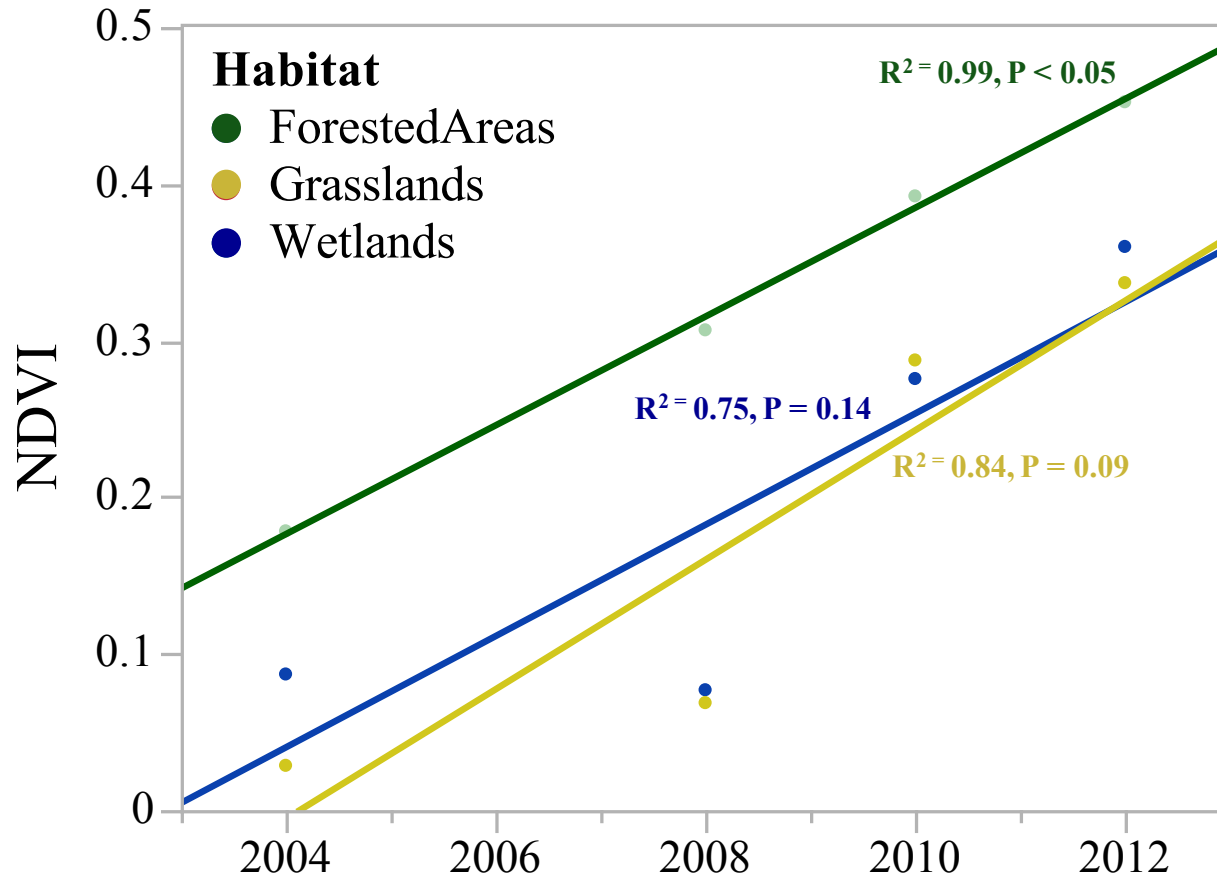


Figure 1: Collection of Mean NDVI's of ForestedAreas, Grasslands and Wetlands from years 2004, 2008, 2010 and 2012. Our results show that there has been an increase in vegetation since 2004.

Final Thoughts

- Although the Grasslands have a greater surface area coverage than the wetlands, 2004 mowing of the grasslands may have had an influence on our NDVI analyses.
- Increased vegetation density within our Forested Areas may be associated with increases in invasive vine species.
- Shadows may have affected our NDVI results as shadowed regions tend to have the same NDVI values as dense vegetation.
- Future studies can be done to determine the percentage of invasive vine species coverage in Forested Areas and if this has had an effect on bird species populations between 1990 – 2013.

Acknowledgments

- Special thanks to Professor Douglass for his patience and consideration in giving me this project to work on.
- Special thanks to Eunice Kim and Cassandra Cronin for their contributions to this project and my wonderful lab partners who always kept my spirits high even during long field days 😊
- Special thanks to Ms. Amberlee for her guidance throughout this project and Professor Ibraheem for teaching me these advanced GIS skills.

