Seasons' Greens

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Introduction: Every year, nearly every location on Earth experiences periods of cold and warmth, which we recognize as seasons. In this project, I aim to analyze how seasonal changes affect the environment, specifically, by focusing on vegetation. Using the Normalized Difference Vegetation Index (NDVI), it is the goal of this project to identify what effect seasons actually have on vegetation health. To conduct this project, and to control for any changes in the NDVI values that do not arise from seasonal temperature changes, we will be looking at a controlled ecosystem, which, in this case, will be the Great Dismal National Wildlife Refuge in Southern Virginia and Northern North Carolina.

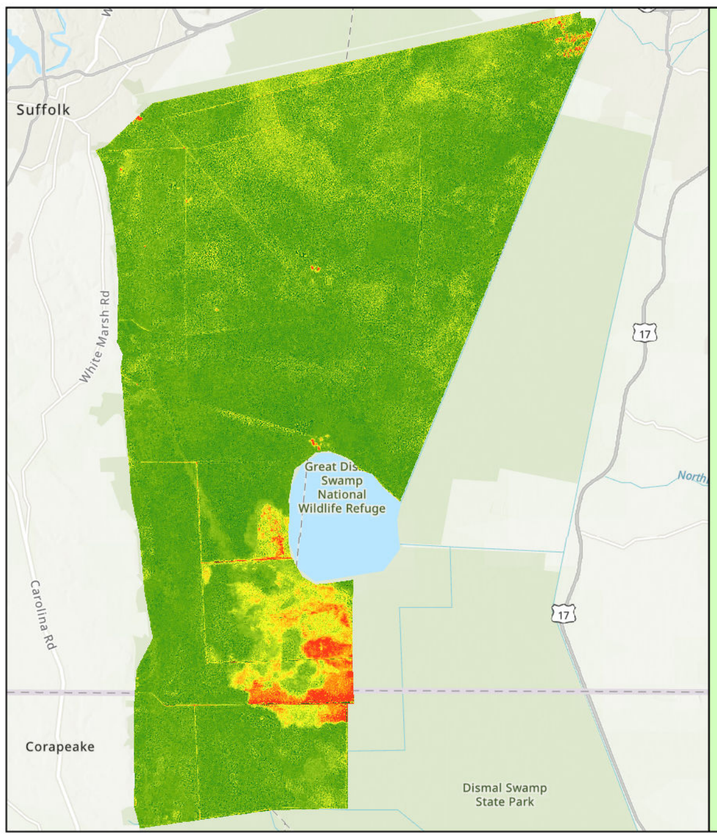
Process: The first step in this projected was to source the data, which in this case, had to be IIRG images, and to do this, I had to utilize satellite imagery taken over one place in two different seasons, which is what I did. Using the European Space Agencies' Sentinel-2 L2A satellite I obtained summer and winter IRRG 10m photos of the Great Dismal Swamp National Wildlife Refuge. Once obtaining the images, they needed to be georeferenced, so that we could properly limit the analysis to one specific area, and this is what was done. After georeferencing both of the images and selecting the area of interest, an NDVI analysis was performed using one of the many image raster functions included in ArcGis Pro, and it was here where we start to see results, but we needed specific statistics, which is what I did next. Using the "Calculate Statistics" geoprocessing tool, statistics regarding the NDVI values had been calculated, and findings could now be made.

Findings: The findings of this project are, generally speaking, what I would expect, but they were not as extreme as I would have expected. Specifically, in the summer season, the average NDVI value was ~0.8918, and in the winter season, the average NDVI value was ~0.6531, a decrease of approximately 27%, but this does not mean we should conclude that vegetation is 27% healthier in the summer, as it is more complex than this. Instead, we should rely on established predetermined values, which state that 'NDVI values between 0.4 and 0.6 indicate moderate vegetation health/density, and values above .6 indicate high vegetation health/density' (EOS Data Analytics, n.d.). Based on these values, the NDVI statistics suggest that from summer to winter, vegetation transitions from being very healthy and dense to moderately healthy and dense, rather than becoming outright "unhealthy," which I would have expected.

Sources:

EOS Data Analytics. (n.d.). NDVI FAQ: All you need to know about NDVI. Retrieved November 23, 2024, from https://eos.com/blog/ndvi-faq-all-you-need-to-know-about-ndvi/
European Space Agency (ESA) Sentinel-2 L2A Data. Retrieved via EO Browser, Sentinel Hub. URL: https://apps.sentinel-hub.com/eo-browser/.

Maps:



Summer NDVI Map

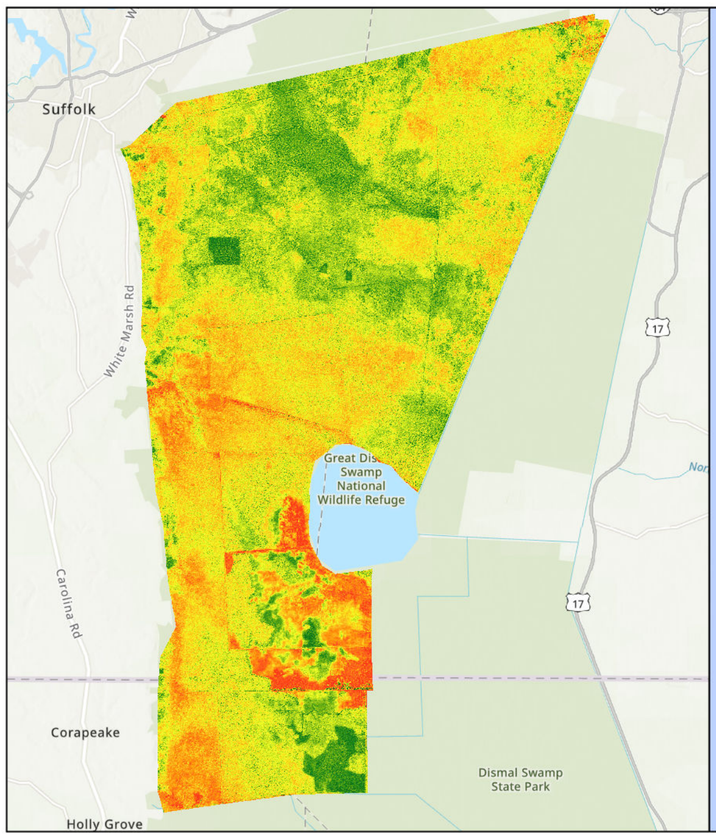
NDVI Raster General Stats:
NDVI Min: ~.0968
NDVI Max: 1
NDVI Mean: ~.8918
NDVI Std. Dev: ~.0478

NDVI Image Source Information:
Bands Used: 8(IR), 4(RED), 3(GREEN)
Resolution: 10m
Georeferenced: Manually
Satellite: Sentinel-2 L2A
Date Taken: May 29, 2024

NDVI Cell Values Legend:
Value
1
0.0967742

N

0 0.75 1.5 3 4.5 6 Miles



Winter NDVI Map

NDVI Raster General Stats:
NDVI Min: ~-.3333
NDVI Max: 1
NDVI Mean: ~.6531
NDVI Std. Dev: ~.1197

NDVI Image Source Information:
Bands Used: 8(IR), 4(RED), 3(GREEN)
Resolution: 10m
Georeferenced: Manually
Satellite: Sentinel-2 L2A
Date Taken: Jan 10, 2024

NDVI Cell Values Legend:
Value
1
-0.333333

N

0 0.75 1.5 3 4.5 6 Miles