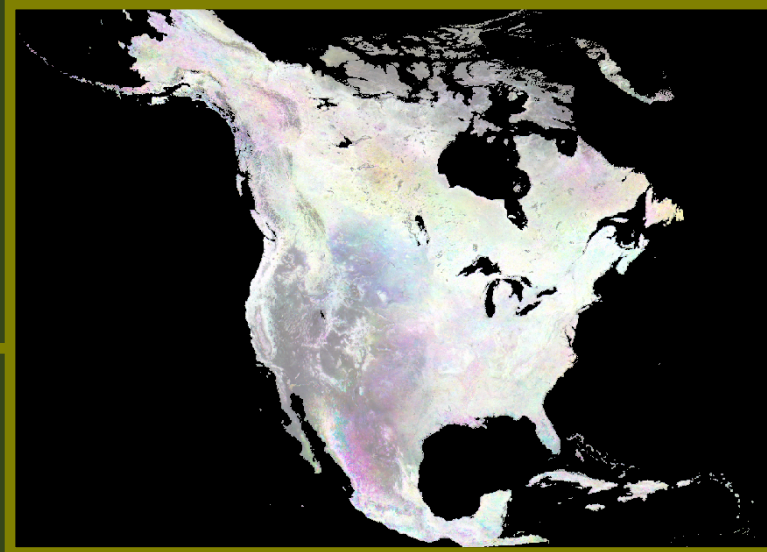


Using Change in NDVI Values Over Time as an Indicator of Ecological Resilience of the VA Eastern Shore

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Gavin Schmidt



Goals and Objectives

- To determine change in Normalized Difference Vegetation Index (NDVI) on Virginia's eastern shore region over time
 - Subset by land cover type
 - Determine precipitation and drought effects and correlations
- To provide useful information for those looking to describe the ecological resiliency of the eastern shore

Methodology

- Gather yearly NDVI, land cover, precipitation and drought data
- Compute statistics for each year as a whole and for the whole time period
- Overlay land cover raster to get zonal statistics
- Compute statistics for NDVI to obtain mean and standard deviation
- Compare NDVI of each year to 23-year mean
- Produce maps showing change from base condition every year
- Produce graphs showing change over time for entire region as well as by land cover type
- Correlate mean NDVI and precipitation

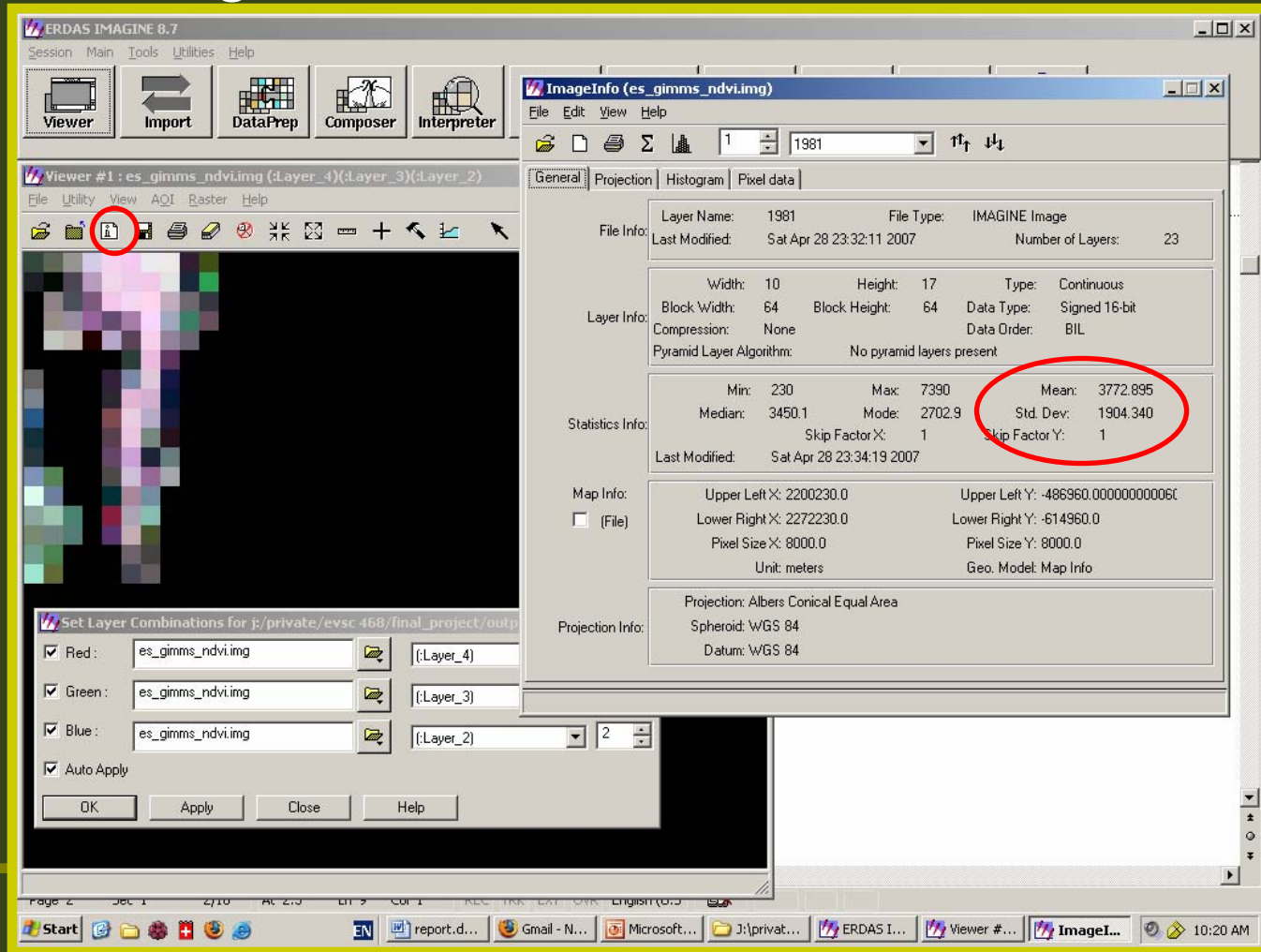
Gathering Data

- Global Inventory Modeling and Mapping studies (GIMMS) data
 - Normalized Difference Vegetation Index (NDVI) product available over 23 years
 - Obtain through Global Land Cover Facility (GLCF)
 - Used 15-day composites of each year during first part of August—subset to VA eastern shore region

Gathering Data (cont.)

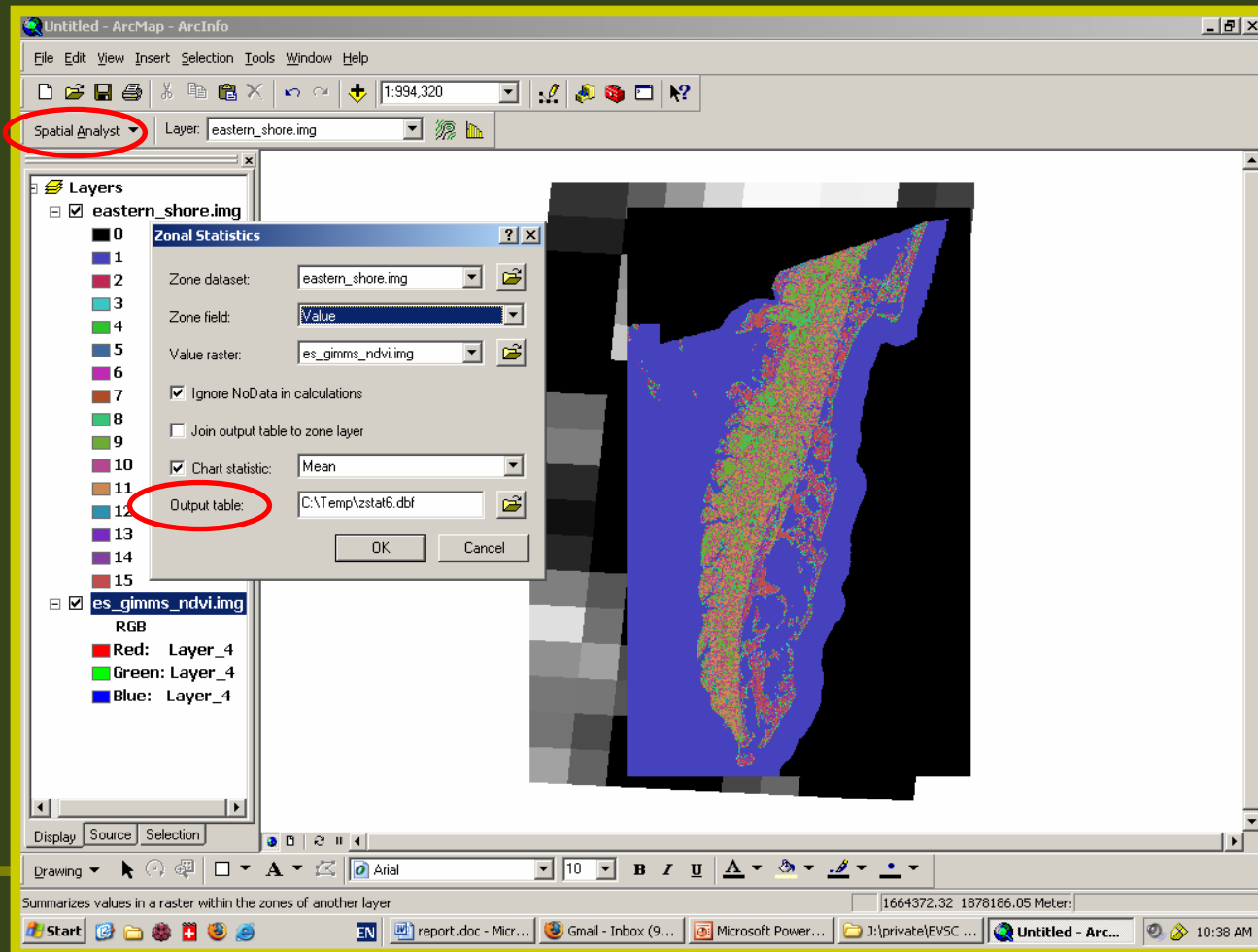
- NLCD (National Land Cover Data)
 - 21-class land cover classification scheme produced from Landsat's Thematic Mapper (TM) sensor
 - Available through Global Land Cover Facility (GLCF)
 - Used Virginia Land Cover Data Set subset to eastern shore—only 6 land cover classes
- Precipitation Data
 - Used Hog Island monthly precipitation measurements (mm)
 - Available through VCR LTER
- Drought Data
 - Palmer Drought Index for Virginia Region 1

- Use Image Information on Viewer



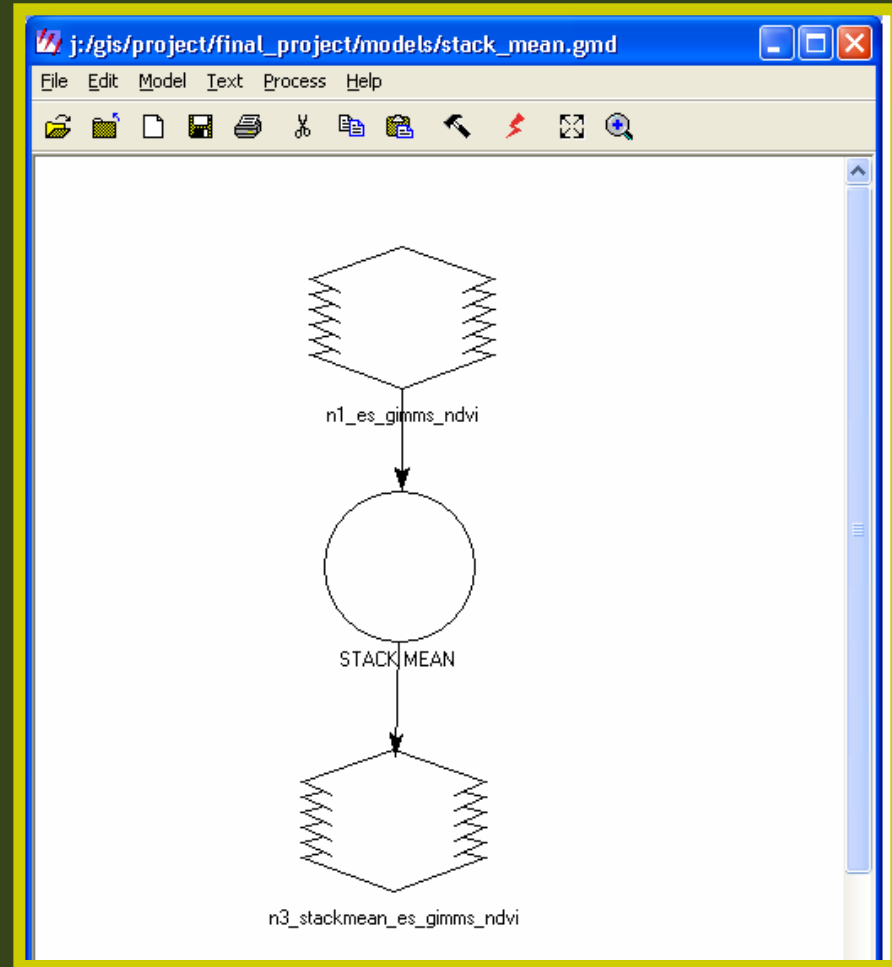
Identify Land Cover Regions & Get Stats

- Overlay land cover on GIMMS—use Zonal Statistics in ArcGIS Spatial Analyst Extension



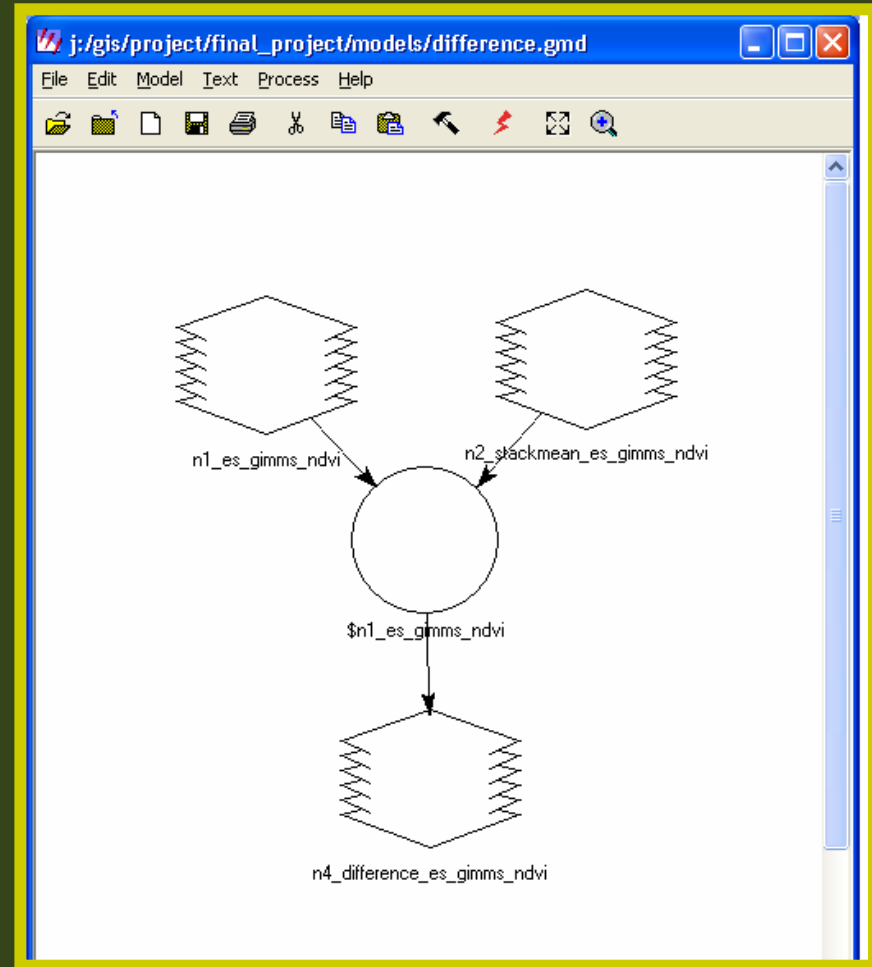
Finding Mean NDVI

- Used ERDAS
Imagine Model
Builder
 - Function
STACK MEAN
- Yields raster
where each
pixel is mean of
that pixel over
23 years



Compare Each Year to Mean

- ERDAS Imagine Model Builder
 - Simple Subtraction

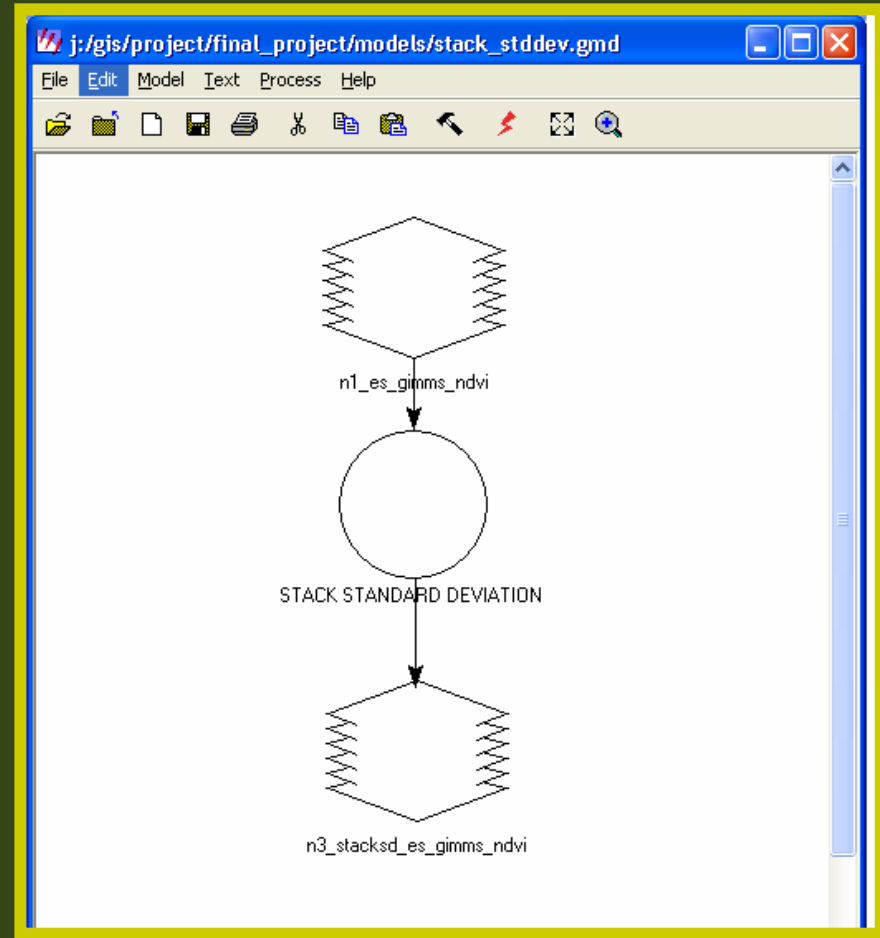


Compare Each Year to Mean (cont.)

- Issues
 - Year to Year always some change in NDVI
 - Simple subtraction yields no difference
 - What is “different enough”?
 - 1, 2, 3 Standard Deviations away from mean?

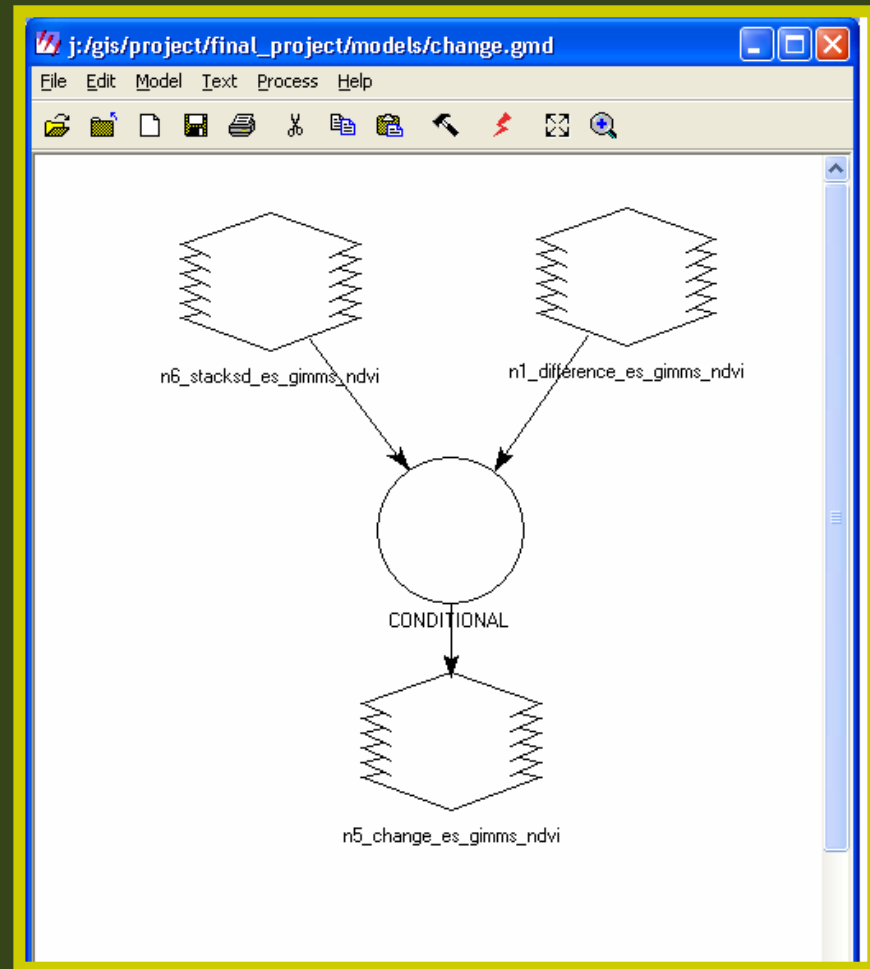
Compare Each Year to Mean (cont.)

- Finding Std. Dev.
- Used Model Builder
 - Function Stack STANDARD DEVIATION
- Yields raster containing standard deviation of each pixel over 22 years



Compare Each Year to Mean (cont.)

- Determining Difference
 - Model Builder
 - Conditional Statement decides 1, 2, or 3 SD away
- Yields raster where each pixel indicates its 0, 1, 2, or >3 SD away



Correlate Mean NDVI and Precipitation

- Used statistical package
 - StatTools Extension for Excel
- Compared June, July, August, and average summer precip. to mean NDVI
- Scatter Plot and Correlation

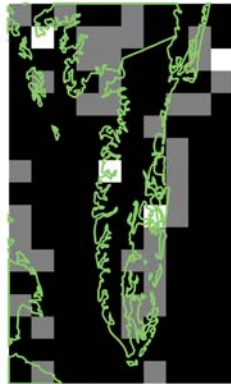
Results

- Change Maps
- Change Trends
 - Community
 - Land Cover
- Relation to Precipitation

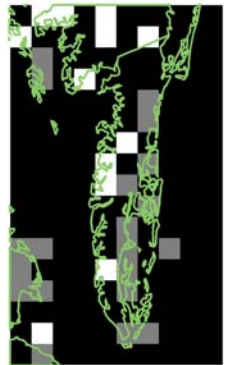
Some Change Maps



1985 - mean



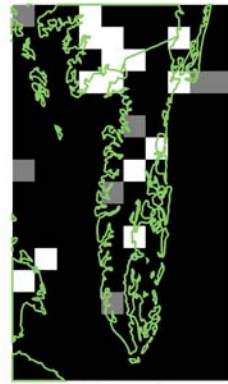
1986 - mean



1987 - mean



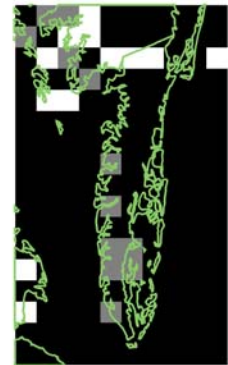
1988 - mean



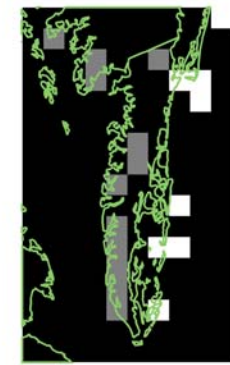
1989 - mean



1990 - mean

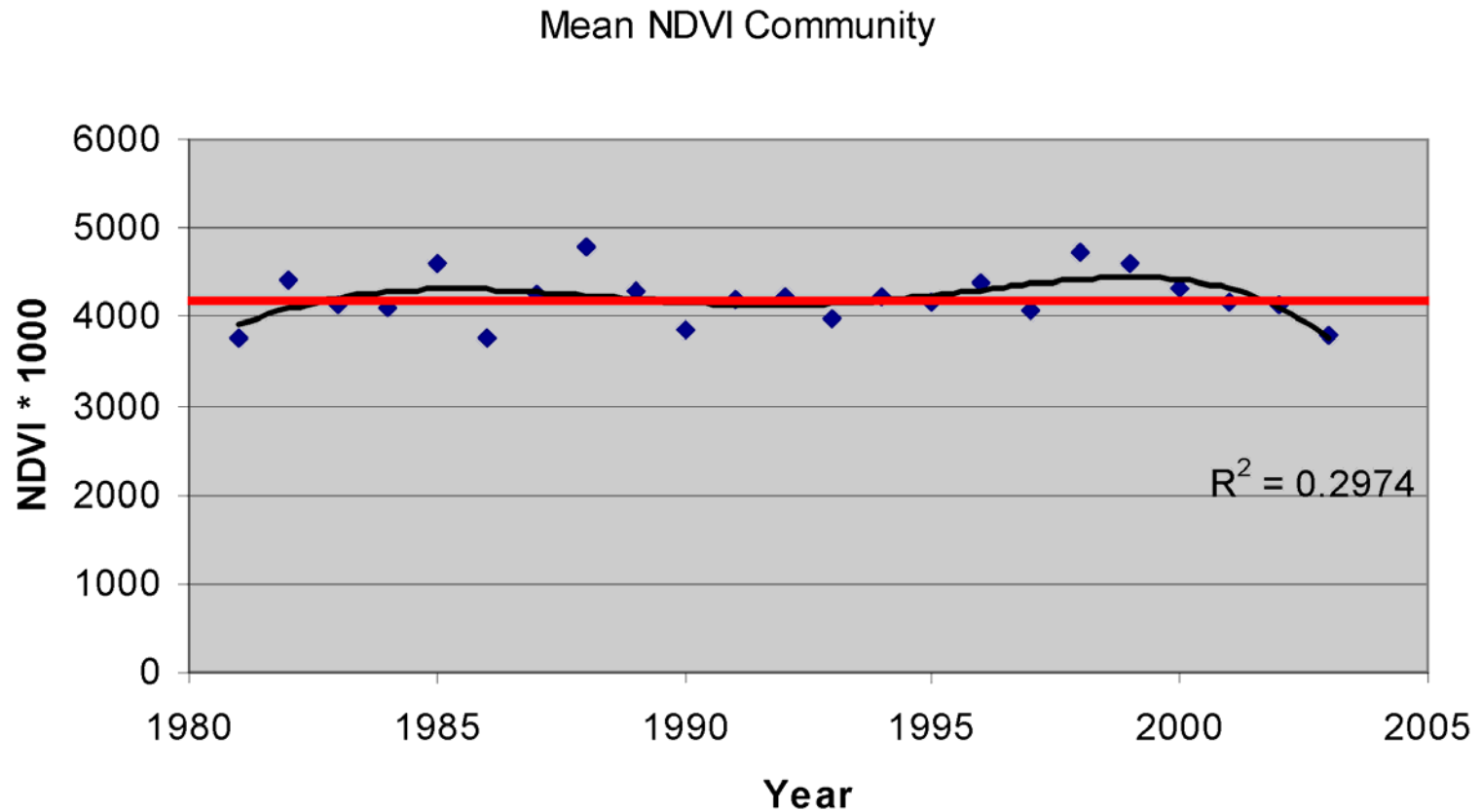


1991 - mean



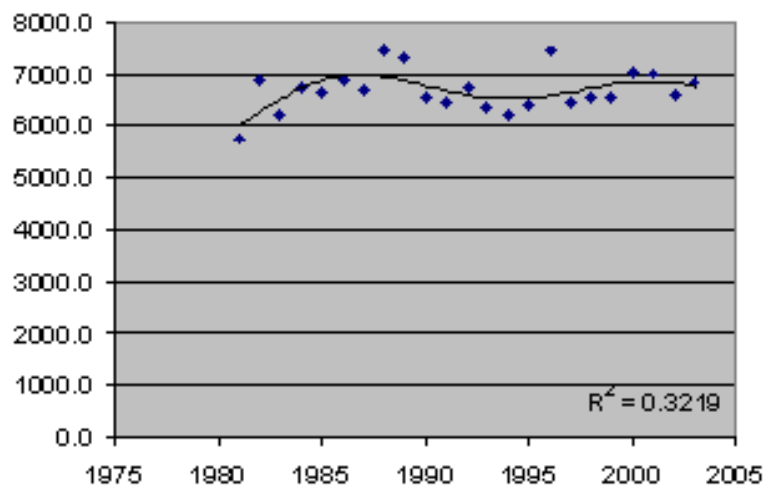
1992 - mean

Change Trends (Community)

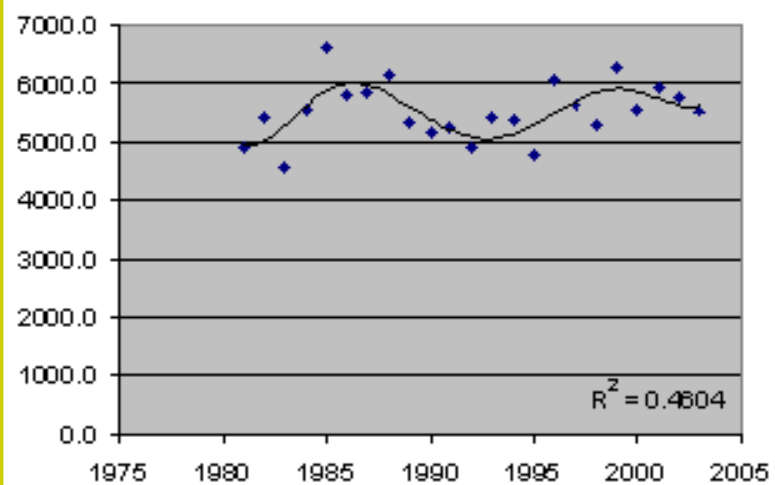


Change Trends (Land Cover)

Bare Rock/ Sand/ Clay

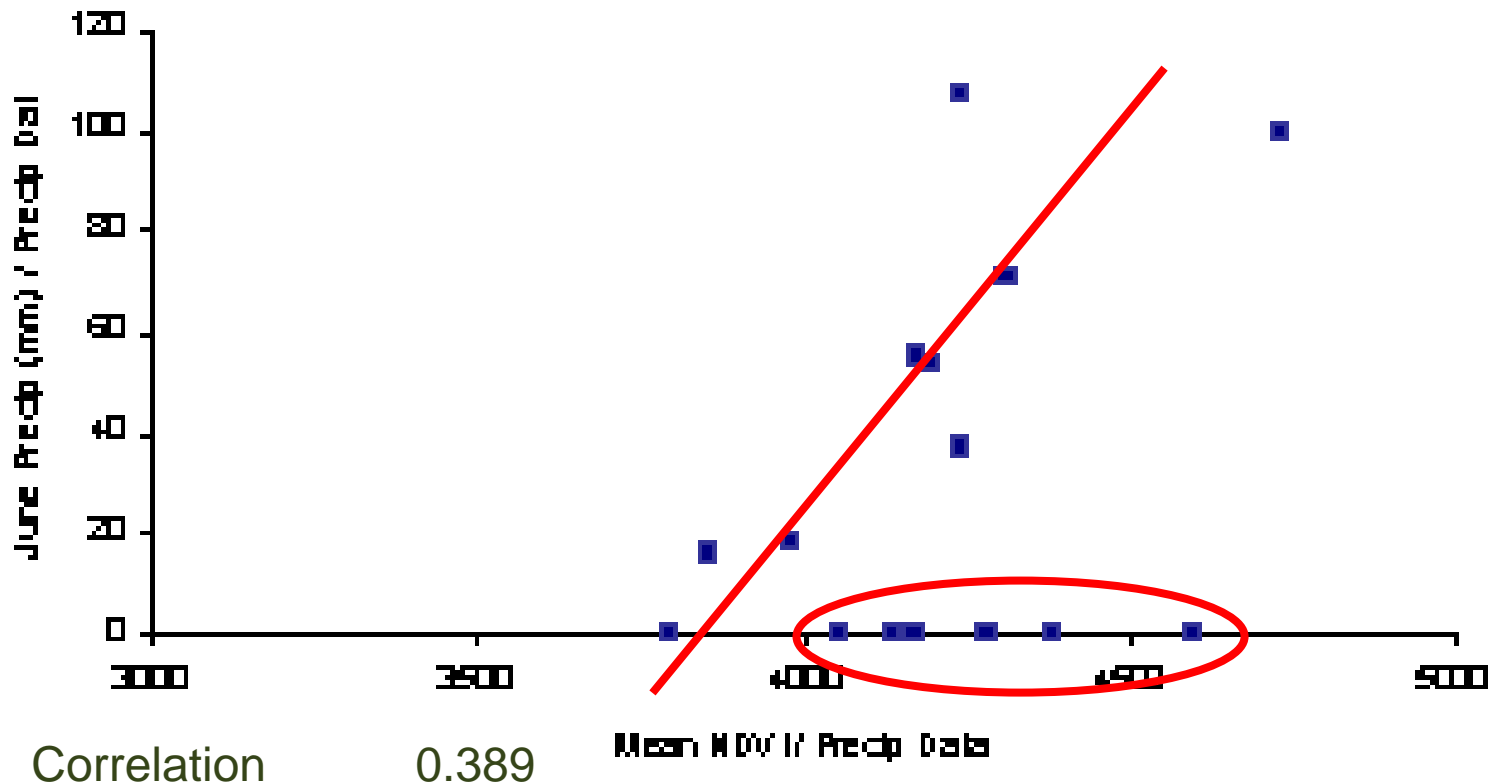


Deciduous Forest



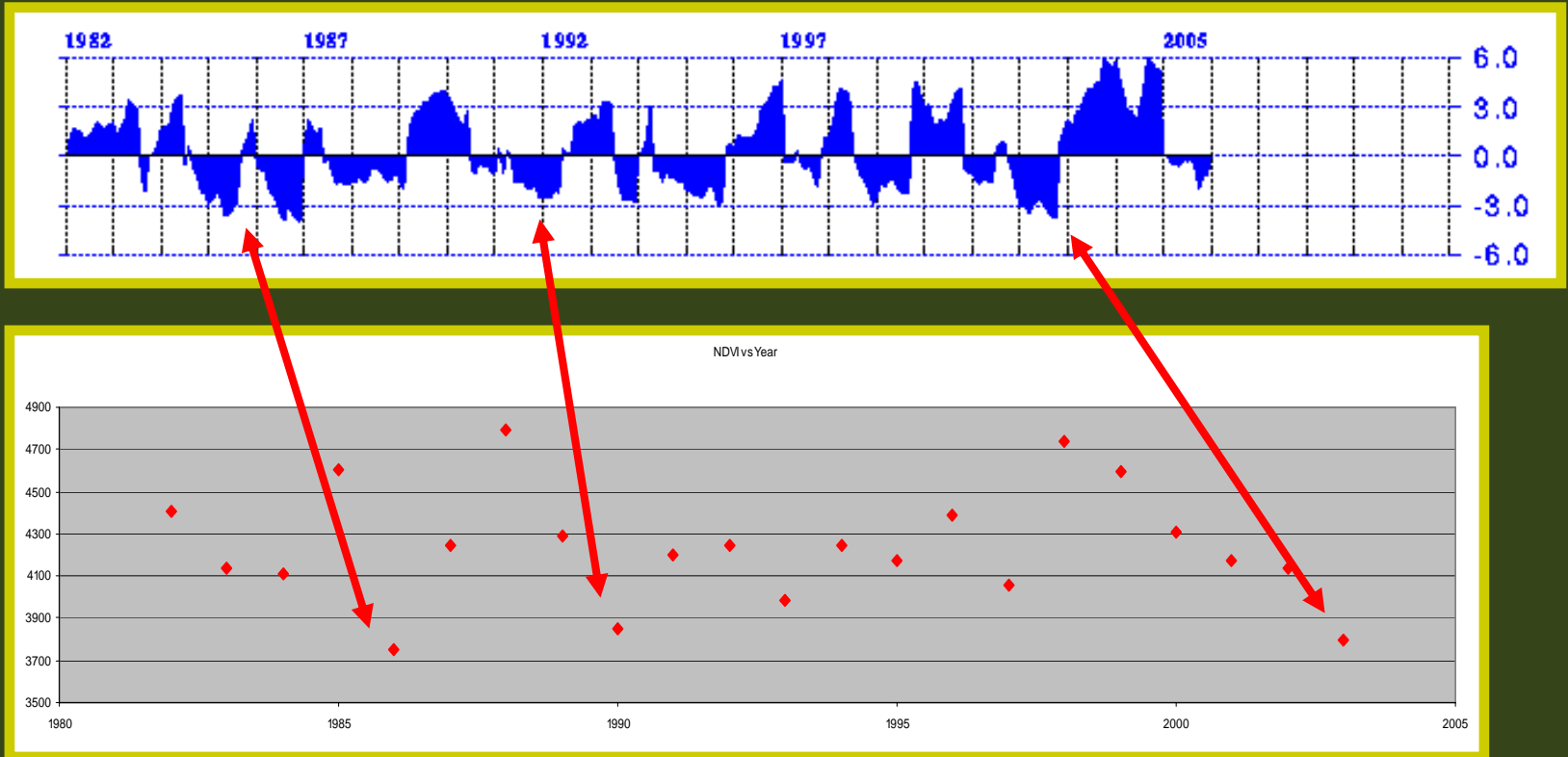
Relation to Precipitation

Scatterplot of June Precip (mm) vs Mean NDVI of Precip Data



Relation to Precipitation (cont.)

- Palmer Drought Index Virginia Shore Region



Conclusion

- Community NDVI changes fairly significantly over time
- Different land cover classes vary NDVI more widely than others
- Precipitation seems to have some effect on NDVI, though highly likely that other factors are at work

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