**NASA DEVELOP National Program**

****Stennis Space Center

**Spring 2014**

**U.S. Disasters and Ecological Forecasting**

*Assessing the Potential to Use VIIRS Data for Detecting Forest Disturbance from Insects and Fire*

**Team Lead:** Jamie Thompson (University of Southern Mississippi),
jamie.l.thompson@eagles.usm.edu

**Team Members:**

Brittany Howell (University of Southern Mississippi)

Alyssa Pourmonir (State University of New York Maritime College)

Timothy Sutherlin (University of Southern Mississippi)

Heather Nicholson (University of Southern Mississippi)

**Advisors & Mentors:**

Joseph Spruce(CSC, Stennis Space Center)

**Past or Other Contributors:**

* Southeast Agriculture
* Summer 13 Mobile County Health Department
* *Assisting state and federal post-wildfire assessments through the application of EOS data*

**Applied Sciences National Applications Addressed:**

Disasters & Ecological Forecasting

**Study Area:**

Pearl River swamp: St. Tammany Parrish, LA; Pearl River County, MS; and Hancock County, MS (2012/2013 caterpillar defoliation)

Yosemite National Park, California (2013 Rim Fire)

**Study Period:** March 2012 – August 2012
August 2013 - October 2013 and possible comparisons to the same months from previous years

**Community Concerns**

* There are numerous biotic (e.g., beetles, caterpillars, diseases) and abiotic (e.g., fires, tornadoes, droughts) factors that threaten forested lands; therefore, detecting and evaluating them in a timely manner is critical to an effective mitigation strategy
* There is a need for forest managers to be able to detect these threats accurately and quickly
* Moderate Resolution Imaging Spectroradiometer (MODIS) has been widely used to detect the forest threats; however, it is now well passed its six year life span and it is essential for the development of alternative methods for detection.

**80-100 Word Blurb**

This project focuses on the use of NASA remote sensing to compute forest disturbance detection products for biotic factors, such as caterpillar defoliation, and abiotic factors, such as fires. Currently, Normalized Difference Vegetation Indices (NDVI) from the MODIS sensor are being utilized to create detection products for the ForWarn system. As the MODIS sensor reaches the end of its lifespan, there is now a need to transition this task to different sensors. NDVI that is calculated from the VIIRS sensor is a suitable replacement for MODIS NDVI products.

**Abstract**

Numerous biotic (e.g., caterpillars, beetles, and diseases) and abiotic (e.g., droughts, fires, and tornadoes) factors threaten forested lands all over the world. Although these threats can never be completely removed, detecting and evaluating them during the early stages of events is critical to an effective mitigation strategy. Thus, forest managers require accurate and timely forest monitoring and assessment tools. For years, Moderate Resolution Imaging Spectroradiometer (MODIS) data have played a pivotal role in meeting this need. ForWarn, a website for satellite-based change recognition and tracking, currently uses MODIS data products to locate these disturbances by calculating Normalized Difference Vegetation Index (NDVI). However, with both existing MODIS sensors now operating well beyond their six-year design life, it is essential that new methods are rapidly developed for using Visible Infrared Imaging Radiometer Suite (VIIRS) data in a comparable fashion. This will ensure uninterrupted decision support to forest resource managers and enable ForWarn to further asses integrating the use of VIIRS into the ForWarn Forest Change Assessment Viewer.

**Partners/Collaborators**

USDA Forest Service (POC: William “Bill” Hargrove)

Oak Ridge National Laboratory (POC: Forrest Hoffman)

**Current Management Practices & Policies**

ForWarn currently uses MODIS data to produce NDVI products for the ForWarn Forest Change Assessment Viewer. Since MODIS may be reaching the end of its useful life span, ForWarn is currently assessing implementing VIIRS products into this tool.

**Benefit to End-User:**

* Target disturbance areas that require mitigation efforts and which mitigation methods to use
* Determine when and where a change or disturbance has occurred

**Decision Support Tools**

* NDVI percent change index calculated from VIIRS

**Earth Observations & Parameters**

* Suomi NPP, VIIRS- Moderate resolution band ratios, vegetation indices, and change detection products
* Aqua & Terra, MODIS- Moderate resolution band ratios, spectral vegetation indices, and change detection products.
* If time permits:
	+ Landsat 8, OLI – High resolution band ratios, vegetation indices, and land use/land cover products
	+ Landsat 5, TM – High resolution band ratios, vegetation indices, and land use/land cover products
	+ USDA Aerial Photography, NAIP – Very high resolution multispectral Earth surface observations

**Future Applicable NASA Missions**

* N/A

**Models Utilized**

Although no computer models are planned to be used in this project due to the time constraints of a spring DEVELOP term, a vegetation index and change detection modeling approach will be employed.

**Ancillary Datasets Utilized**

USDA Forest Service field service reports
USDA Forest Service aerial detection survey reports
*ForWarn* forest change detection products
Burn scar shapefiles

**Software Utilized**

Erdas Imagine – Raster Manipulation/ Analysis

ArcGIS - Raster Manipulation/Analysis, Image Enhancement & Map Creation of NPP VIIRS, Aqua/Terra MODIS