**NASA DEVELOP National Program**

****Goddard Space Flight Center

**Spring 2015**

**Idaho Disasters II**

*Using NASA Earth Observations to Identify Savannah and Shrubland Vegetation in Southern Idaho*

**Project Team:**

Jeff May (Project Lead), mayja02@gmail.com

Andrea Bodenberg

Kiersten Newtoff

Kyle Sowder

**Advisors & Mentors:**

John Schnase (NASA GSFC)

Mark Carroll (NASA GSFC)

Keith Weber (ISU GIS TReC)

**Past or Other Contributors:**

Eric Smith

Kathryn Bradford

**Partner Organizations**

Bureau of Land Management, Idaho State Office and cooperating District Offices, End-User, POCs: Steve Jirik & Mike Kuyper

Idaho Department of Lands, Boise Field Office, End-User, POCs: Dixie Booker-Lair & Robin Dunn

**Applied Sciences National Applications Addressed:**

Disasters

**Study Area:** SE Idaho, United States

**Study Period:** April 2014 - October 2014

**Earth Observations & Parameters**

Landsat 8, OLI/TIRS - Spectral bands to calculate vegetation and soil indices

Terra, MODIS - NDVI products

**80-100 Word Objectives Overview**

Introduction of cheatgrass (*Bromus tectorum*) in southern Idaho has drastically altered wildfire regimes in the area. The fire season length has substantially increased and wildfires have become a more frequent threat to wildlife habitats, grazing resources, and human infrastructure.  To better understand wildfire regimes as they relate to the distribution of vegetation, this study will perform a multi-temporal, multivariate spectral analysis to classify vegetation throughout the study area.  This information will be used in future fire susceptibility models that will enhance the decision making and resource allocation powers for our End Users.

**Abstract**

Wildfires play an important role in ecosystem health, with many native plant species dependent on fire to complete their life cycle. Wildfires also burn dead vegetation, which recycles nutrients back into the soil. However, longer dry periods and the prominence of invasive species, e.g. *Bromus tectorum*, have created favorable conditions in the western United States for larger and more frequent wildfires, which can disrupt ecosystems, human localities, and the critical habitats of endangered wildlife. To prepare for the fire season in Idaho, the Bureau of Land Management (BLM) and the Idaho Department of Lands (IDL) use vegetation moisture measurements from the National Fuel Moisture Database to identify and allocate resources to regions with drier vegetation during the year. In order to supplement their current data products, we will create a 30m vegetation map to identify vegetation species with high fire risk and highlight areas of high fuel concentration. The vegetation map will be created using a decision tree model on Landsat 8 imagery throughout the year in southern Idaho. The results and data gathered from this study will support IDL and BLM in resource allocation early in the fire season and planning fuel load reduction activities following the fire season.

**Community Concerns**

* Wildfires are destructive to grazing and wildlife resources and adversely affect critical habitat zones of endangered sage grouse.
* Wildfires have occurred for millennia, but climate change and related factors have been increasing the amount of burned area in by 355 km2 per year since 1984[1]. This has created a demand for advanced wildfire decision support capabilities.
* Following fire, ground vegetation is typically eliminated, leaving the landscape devoid of cover. These communities may then experience a series of adverse changes due to landslides, soil erosion, and invasive plant infestations.

[1] Dennison, P.E., Brewer, S.C., Arnold, J.D., & Moritz, M.A. (2014). Large wildfire trends in the western United States, 1984-2011. Geophysical Research Letters, 41(8), 2928-2933.

**Current Management Practices & Policies**

Currently, the BLM uses vegetation moisture measurements that are collected at two week intervals in discrete locations across the state.  The measurements are collected from March to October by various national, state, local, and independent agencies and entered into the National Fuel Moisture Database.  Areas with drier vegetation receive resources such as helicopters, dozers, and other fire suppression equipment from BLM field offices; 16 total in Idaho, that are experiencing lower fire susceptibility conditions.  The Idaho Department of Lands follows similar guidelines, but they respond to fewer fires since most of the land in southern Idaho is managed by the BLM.  Fire management standards and policy are defined in the 2014  Interagency Standards for Fire and Fire Aviation Operations manual (“Redbook”) produced by the Federal Fire and Aviation Task Group, National Interagency Fire Center in Boise, ID.

**Decision Support Tools**

* Vegetation map for identifying regions with vegetation that ignite easier and dry out faster.
* Methodology for assessing vegetation and soil moisture to identify fire susceptibility throughout the region.
* Methodology for a consistent re-evaluation of vegetation in the study region each year.

**Benefit to End-User:**

* The BLM is responsible for the wildland fire management of 12 million acres of land in Idaho. IDL is the primary state-level agency responsible for dealing with wildfire in Idaho. This research aids both agencies in resource allocation across their managed lands.
* Other agencies responsible for wildfire management, such as the U.S. Forest Service, can use the vegetation map in their own decision processes.

**Models Utilized**

* Decision tree model

**Ancillary Datasets Utilized**

* World View 2 commercial satellite imagery - visual imagery
* USGS National Land Cover Dataset (NLCD) - land cover

**Software Utilized**

ENVI 5.2 - land classification of Landsat 8 imagery, Raster Manipulation/Analysis

ArcGIS 10.3 - Image Enhancement & Map Creation of Landsat 89 OLI/TIRS

IDRISI – Image Segmentation