**NASA DEVELOP National Program**

GIS Training and Research Center, Pocatello, Idaho

**Summer 2015**

**Idaho Disasters III**

**Subtitle:** Using Landsat 8 Earth Observations to Identify Increased Fire Hazard Due to Invasion of Cheatgrass (*Bromus tectorum*)

**VPS Title:** A Burnin’ Range of Fire: Mapping Fuel Distribution to Assess Fire Hazard in SE Idaho Rangelands

**Project Team & Partners**

**Project Team:**

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**Advisors & Mentors:**

Keith Weber (Idaho State University)

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**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

NASA RECOVER, Boundary Organization, POCs: Keith Weber, John Schnase, & Mark Carroll

USGS, Collaborator, POC: Collin Homer

**Project Details**

**Applied Sciences National Applications Addressed:**

Disasters

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

**Study Period:** April - September, 2013 & 2014; April - June, 2015

**Earth Observations & Parameters**

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

**Ancillary Datasets Utilized**

* USGS National Land Cover Dataset 2011(NLCD) - Land cover
* USGS National Gap Analysis Program (GAP) - Land cover
* USGS Biodiversity Information Serving Our Nation (BISON) - Plant species occurrence data
* Center for Invasive Species & Ecosystem Health, University of Georgia - Cheatgrass distribution point data
* GIS Training & Research Center, Idaho State University Field Samples - Dominant land cover and cheatgrass point features
* USDA Idaho Cropland Data Layer, 2010 - Land cover

**Models Utilized**

* Classification Tree Analysis (Clark Labs)

**Software Utilized**

ArcGIS 10.3 - Image enhancement, map creation of Landsat 8 OLI, post-image processing

IDRISI TerrSet - Image processing, Classification Tree Analysis, Atmospheric correction, and image classification

Hawth’s Analysis Tools - Random selection of class subsets for training and validation sites

Python – Software integration and batch processing

Pheno-Calc (GIS TReC) - Match calculations to more strategically select remotely sensed imagery for analysis

**Project Overview**

**80-100 Word Objectives Overview**

The Idaho Disasters III DEVELOP project will explored the distribution of cheatgrass (*Bromus tectorum)*, an invasive species in Idaho rangelands, and other vegetation and the affect that this distribution has on wildland fire in the region. Cheatgrass is detrimental to Idaho’s rangeland ecology due to its ability to rapidly invade disturbed areas and increase the frequency of wildland fires. This study will include multi-spectral analysis of Landsat 8 Operational Land Imager (OLI) imagery and a Classification Tree Analysis to delineate land cover distribution throughout the study area with special attention given to the distribution of vegetation and examine how climactic variables affect this distribution. The results of this study will benefit the broad fire community and extend the data products and technical capabilities of the RECOVER decision support system for use by the Bureau of Land Management and Idaho Department of Lands in southern Idaho by identifying populations of cheatgrass in order to facilitate better management of these areas.

**Abstract**

Wildfires, coupled with the presence of invasive plant species, are primary drivers of change in semi-arid savanna ecosystems. These wildfires disrupt ecosystems, human localities and critical habitat of endangered Sage Grouse (*Centrocercus urophasianus)*, and create opportunities for invasive species to increase their population size. Wildland fire regimes have also expanded due to *Bromus tectorum*, an invasive annual grass commonly referred to as Cheatgrass, which has effectively lengthened the wildfire season and increased the frequency in which a specific area experiences wildfire events. Due to *Bromus tectorum’s* ability to establish itself in disturbed areas quickly, it is self-promoting by creating a positive feedback cycle with wildland fire. This creates a need for more advanced landscape and wildfire monitoring tools that incorporate species-level information in order to identify Cheatgrass prominence. Tools such as this enhance decision-making by identifying areas that have a higher fire hazard – enabling more effective mitigation of catastrophic wildland fire and helping prevent the expansion of invasive species. Currently, there are no active Cheatgrass management plans in Idaho due to the overwhelming ability of the plant to transport via various mechanisms and establish quickly. Project end-users at the Bureau of Land Management (BLM) and the Idaho Department of Lands currently rely on *in-situ* vegetation moisture samples to allocate resources to regions with greater fire hazard, but do not consider Cheatgrass presence when preparing for a fire season. This study used imagery from Landsat 8 Operational Land Imagery (OLI) and a decision-tree-based classification to create a vegetation distribution map and include discrimination of Cheatgrass. The results will enhance BLM and IDL decision making with respect to allocation of resources before wildland fire occurs, as well as supports post-fire rehabilitation planning and post-fire season fuel reduction programs.

**Community Concerns**

* Climate change and invasive species have created a positive feedback environment leading to increased frequency and duration of wildfire regimes in Idaho.
* In 2012, Idaho spent $211 million dollars combating fires that burned 1.75 million acres resulting in the destruction of 96 structures and loss of life.
* Cheatgrass invasion decreases overall rangeland health and affects grazing allotments and critical habitats of endangered rangeland species.
* Disturbed rangeland is frequently re-inhabited by Cheatgrass.

**Current Management Practices & Policies**

Project end-users currently rely on vegetation moisture measurements to support decisions regarding allocation of helicopters, dozers, and other fire suppression equipment across fire management zones throughout Idaho. These moisture measurement are collected at two week intervals in discrete locations across the state from March to October by various national, state, local and independent agencies and are input into the national Fuel Moisture Database. Presently, there is no active Cheatgrass management program in Idaho, but its effect on rangeland ecology and wildfire regimes is well understood as a problem for Idaho and the Great Basin region.

**Decision Support Tools & Benefits**

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| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Vegetation Distribution Map | Landsat 8 OLI | Provide end-users valuable information regarding fuel distribution in Idaho rangelands to support resource allocation and fuel load reduction programs |

**Project Imagery**

**[Insert image here]**

**Caption:** [Insert Caption Here. Max of 25 words.] Image Credit: [Insert project short title] Team.

**Image:** File Name (Please submit your image as a separate .jpeg as well as inserting it in this document)