**NASA DEVELOP National Program**

****BLM at Idaho State University GIS TReC

**Fall 2015**

**Short Title: Southeast Idaho Disasters**

**Subtitle:** Juniper Encroachment and Management in the Western U.S. Relative to Catastrophic Wildfires

**VPS Title:** The Wildland Urban Interface: People on the Edge/ The Crown of Fire: Juniper’s role in increased fire severity

**Project Team & Partners**

**Project Team:**

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**Advisors & Mentors:**

Keith Weber (GIS TReC Idaho State University)

Mark Carroll (NASA Goddard Space Flight Center)

John Schnase (NASA Goddard Space Flight Center)

**Partner Organizations:**

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

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

Idaho Fish and Game, Collaborator, POCs: Mark Hurley & Evan DeHamer

Forest Service, Collaborator, POC: Chris Colt

**Project Details**

**Applied Sciences National Applications Addressed:** Disasters

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

**Study Period:** August 1990 to October 2015

**Earth Observations & Parameters:**

Landsat 5, TM, - Identify juniper land cover

Landsat 8, OLI - Calculate current juniper land cover

NAIP, Digital CIR – Aerial imagery to collect training data

**Ancillary Datasets Utilized:**

Provider & Dataset

* RECOVER Geodatabase, ISU GIS TReC, Historic Fire polygons – fire history
* Remote Sensing Application Center (RSAC)- Caribou-Targhee NF Existing vegetation map – land cover validation
* Multi-Resolution Land Characteristics Consortium (MRLC) – land cover
* USGS Natonal Gap Analysis Program (GAP) – land cover

**Models Utilized:**

Agency & Model Name (*examples below, please bulletize*)

* USGS National Invasive Species Forecasting System (ISFS)
* Clark Labs – GINI Classification Tree Analysis (IDRISI)

**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

**Project Overview**

**80-100 Word Objectives Overview:**

Past fire suppression efforts has led to juniper species (*Juniperus spp*.) expansion from their native habitats during the last century. This has led to an increase in fuel loads, altered fire regimes, and intensified the severity of wildfires. Land management agencies are interested in mapping junipers in order to manage risk in areas with large fuel loads and allocate pre- and post-fire resources efficiently. Using Earth observing systems the Southeast Idaho Disasters project mapped junipers to determine overall land cover, as well as tree density and frequency.

**Abstract:**

The expansion of junipers from their original rocky terrain into herbaceous communities has altered fire regimes and increased fire intensity not only in Idaho but throughout the Great Basin and Intermountain West. As this species expands it alters many habitat structures, effects soil erosion rates, human life and property, . As junipers are actively expanding they begin to co-dominate communities resulting in the die-off of shrubs, grasses, and forbs. Land Management agencies have a strong desire to find areas that are vulnerable to juniper encroachment so that these areas can be studied and effectively managed. Using aerial imagery this project produced training and validation points that were overlaid onto Landsat 5 Thematic Mapper and Landsat 8 Operational Land Imager imagery to derive spectral signatures of junipers and other vegetation. Using decision- tree- based classification a juniper distribution map was produced to help land managers at the Bureau of Land Management and Idaho Department of Lands in their decision making processes with respect to resource allocation, fuel reduction programs, and post fire rehabilitation planning.

**Community Concerns:**

* Over the past 130 years the Great Basin and Intermountain West has seen pinyon-juniper stands increase 10-fold.
* Juniper encroachment has altered many ecosystems of the Idaho rangelands and decreases the evolutionary health of a multitude of species.
* Encroachment of juniper species increase fuel loads and has created an increase in the size and severity of wildfire.
* Urban sprawl has increased the size of the Wildland Urban Interface (WUI), placing more human life and property at risk of wildfire devastation.
* In 2012, Idaho spent $211 million dollars combating fires that burned 1.75 million acres resulting in the destruction of 96 structures

**Current Management Practices & Policies**:

Currently, the Bureau of Land Management (BLM) primarily use mechanical treatments to manage junipers. Their methods include systematically cutting (removing a proportion of trees within a dense stand) or limbing (removing the lower limbs on all trees within a stand to reduce the potential for a fire to enter the crown) and shredding juniper stands. Controlled burning is another management practice in the broader land management community but this can create a water repellent layer in the soil under juniper canopies. Land rehabilitation practices include aerial seeding and seed drilling (coring holes and dropping in seeds). Seed drilling or chain drilling after aerial seeding are the most effective ways to ensure seeds take root. Efforts by the BLM to mitigate juniper expansion have been met with mixed success in part because pre- and post-treatment of juniper density and frequency is unknown, subsequently the effectiveness of the effort is unknown.

**Decision Support Tools & Benefits:**

|  |  |  |
| --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Juniper distribution map | Landsat 5 TM Landsat 8 OLI NAIP  | 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)

**Software Release Requirements**

What category do the tools your project is creating fall within? Category I

If your decision support tools fall within Category IV, fill out this section:

**Software Title:** Insert here (ex. DEVELOP National Program Python Package)

**Software Abbreviation:** Insert here (ex. dnppy)

**Technical Point of Contact:** Insert full name, permanent email, and node here. Also include whether employed through SSAI or Wise County. (Team member who knows the most about the software.)

**Brief Description of the Software:** Insert here (ex. The dnppy package will be used to functionalize common programming tasks in the geospatial community, specifically for working with NASA data products. It will include functions for processing satellite data and assist in structuring analysis to reduce the startup time for DEVELOP teams to learn programming and create tools for end users.)

**Type of Code:** *Executable Code* and/or *Source Code* (Select one or both)

**Will the software include any embedded computer databases?** *Yes* or *No* (Select one)

**Does the software use or call any open software or libraries?** *Open Source* and/or *Proprietary/Commercial* (Select one or both)

**List the software or libraries used, under what license they were obtained, and the URL for the license in the table below:**

|  |  |  |
| --- | --- | --- |
| **Name** | **License** | **License URL** |
| Ex. Arcpy module | Ex. group license through ArcGIS | http://www.esri.com/software/arcgis |
| Ex. Python | Ex. Open source license | http://opensource.org/licenses/Python-2.0 |
|  |  |  |

**Full Software Description and Plan**

**Introduction/Objective:**

What motivated the creation of this software, what problem does it address?

**Applications and Scope:**

Where and how will this software be used to influence decisions?

**Capabilities:**

What can it do better than what was previously available?

**Interfaces:**

How is one expected to use the software? For example, command line, GUI, script execution, etc.

**Assumptions, limitations, & Errors:**

What areas that the software could be improved upon in the future? This is where limitations of the theory, model, science, etc should be briefly documented. If the tools only work for a specific scenario, say so.

**Testing:**

What validation techniques and testing strategy will be used to build confidence in the software?