

Mapping Burn Severity of the Marking Pen Prescribed Burn in the Seminoe Mountains using pre- and post-fire Landsat Thematic Mapper images

Erik Collier¹ with Ramesh Sivanpillai²

1. Department of Ecosystem Science and Management
 - and 2. Department of Botany
- University of Wyoming

Background

- Wildfires
 - Historic Data
 - From 2003-2012 average of 74,957 wildfires/year
 - Burning average of 7.22 million acres/year
- Wildfires in 2012
 - Burned over 9 million acres in U.S
 - In Wyoming fires over 40,000 acres cost \$34,882,964
 - 13 lives lost
 - 2,125 homes burned
 - Resulting in \$1.2 billion in losses

Prescribed Burns

- Several reasons for this practice
 - Goals are
 - to minimize the intensity of future wildfires (approach: fuel reduction)
 - to improve habitat quality
 - to prevent woody species encroachment
 - to minimize invasive species expansion
- Timing the prescribed fire is important
 - Late spring through early summer (Wyoming)
 - Utilize moisture from snowpack to control the overall area

Marking Pen Rx Burn

- Bureau of Land Management (BLM) conducted a prescribed fire in May 2011
 - Reason for Burn
 - *Vegetation became decadent and stagnant*
 - *Decreased wildlife habitat quality*
 - *“The purpose of the Seminoe Mountains vegetation treatment is to diversify and manipulate existing vegetation community characteristics within the proposed project area, and mitigate present WUI issues.” – BLM Rawlins Field Office*



Marking Pen Rx Burn cont.....

- Date of Burns: 5/2 to 5/8/11
 - Temperature range: 44 to 70 degrees
 - Relative Humidity range: 20 to 56
 - Wind Speeds: 0 to 20 mph
- Vegetation Community-Mountain Shrub Community
 - Antelope bitter brush, Mt. Mahogany, Wyoming big sagebrush, Basin big sage, Limber Pine, Aspen, Juniper, mixed grasses and forbs
 - North slopes contained higher percentage of Aspen & grass-sage community

Marking Pen Creek Prescribed Burn Project

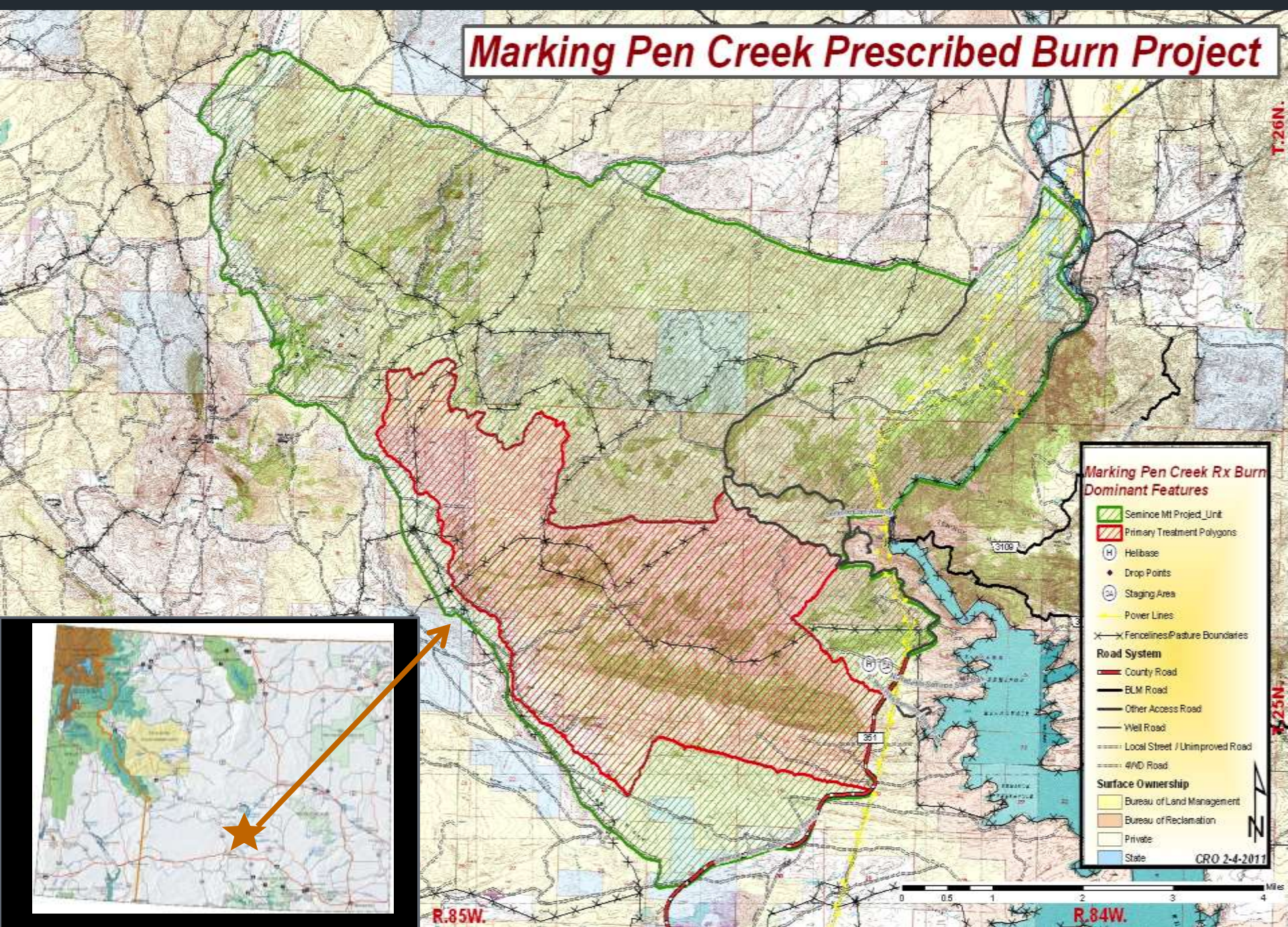


Photo Courtesy of Mike Murry-BLM RFO

Burn classes on the ground

- Low Severity



Medium Severity



Photos Courtesy of Mike Murry-BLM RFO

Classes on the ground cont...

- High Severity
Severity



Medium/High



Photos Courtesy of Mike Murry-BLM RFO

Remote Sensing

- Is the art & science of collecting information without physical contact
- Sensors collect data in the visible and invisible (infrared) regions of the spectrum
- Sensors are mounted on satellites, airplanes, UAS, balloons,

Aerial & Satellite imagery

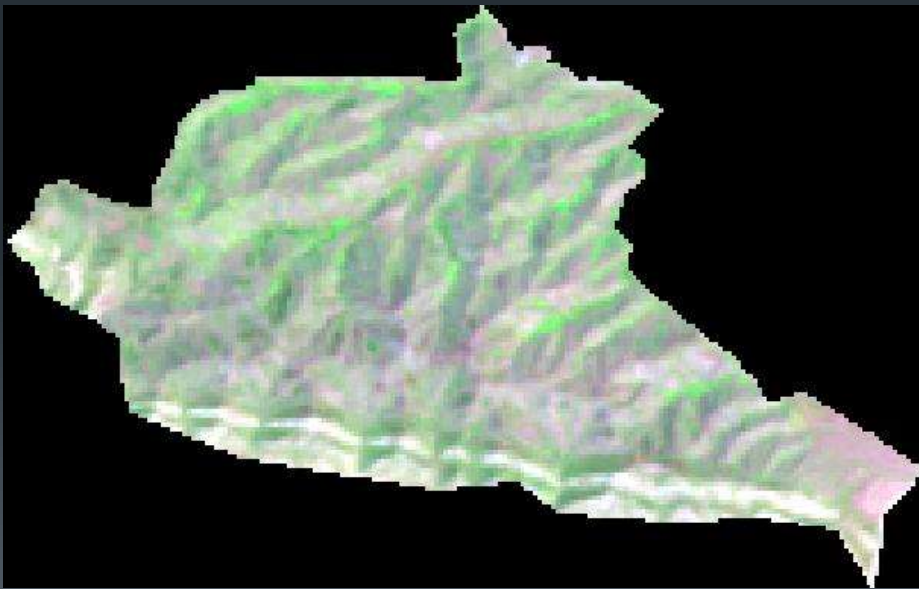
- Aerial
 - Photographs (B&W, Color, Color infrared)
- Satellite (civilian)
 - Landsat is the longest running program
 - Data are collected in six regions (3 visible and 3 infrared)
 - 30m x 30m resolution
 - 16 day revisit time
- Unmanned Aerial Systems (UAS)
 - Are increasingly used for mapping fires and other features

Previous Work

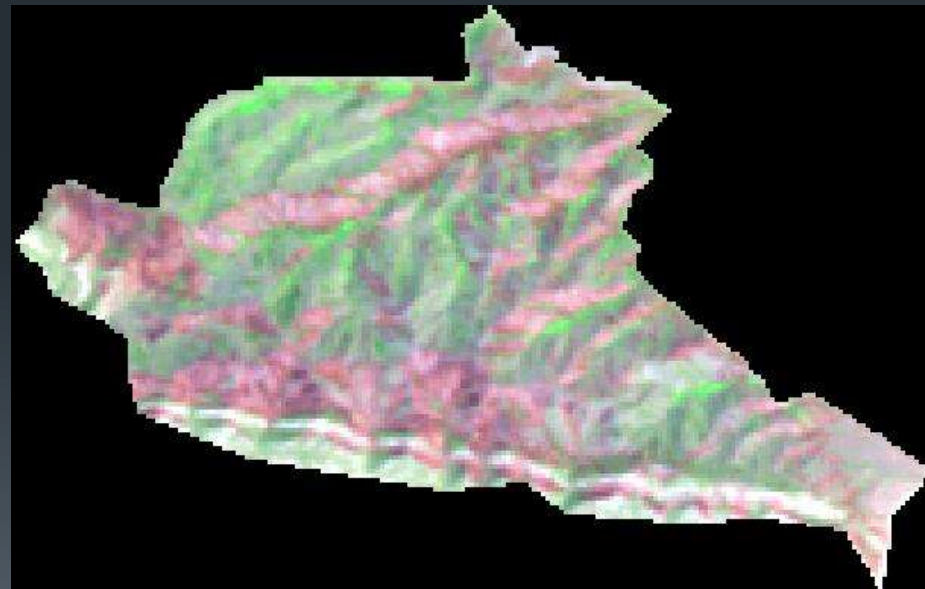
- Past studies have shown that remotely sensed data can be used for mapping burn severity
 - White et al (1996)-Forest Fire Severity & Vegetation Recovery
 - Cocke et al (2005)-Comparison of burn severity assessments using Differenced Normalized Burn Ratio and ground data
- WyomingView (UW) studies:
 - Cobb, 2011
 - *Mapping Forest Burn Severity Using Non Anniversary Date Satellite Images*
 - Stephens and Stanton, 2008
 - *Mapped Burn Severity within the Grizzly Gulch Fire*

Methods

- Present study:
 - Prescribed fire (not as intense as wildfire)
 - Anniversary Landsat images



6/28/2010



6/15/2011

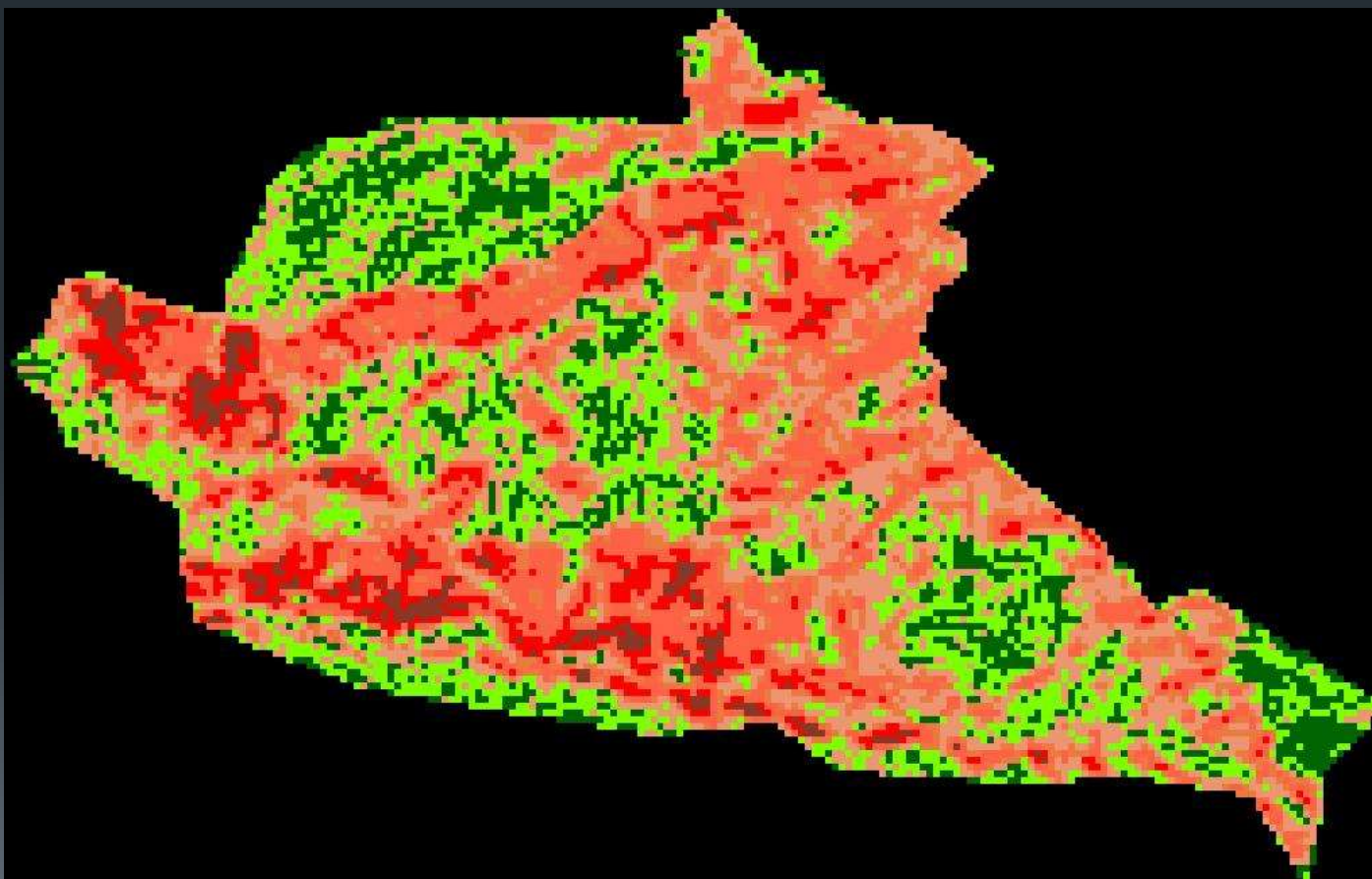
Methods

- Normalized Burn Ratio Index (NBRI)
 - $(\text{Band 4} - \text{Band 7}) / (\text{Band 4} + \text{Band 7})$
- Delta NBRI
 - Pre fire NBRI – post fire NBRI
 - Values range from -1 (no burn/regrowth) to +1 (severe burn)
- Calculated these images in ERDAS Imagine

Classification

- Rule-based classification
- Defined break points between -1 and +1
 - 6 break points were defined that resulted in 7 classes
 1. No burn
 2. No burn – low
 3. Low –
 4. Low - Moderate
 5. Moderate
 6. Moderate – Severe
 7. Severe

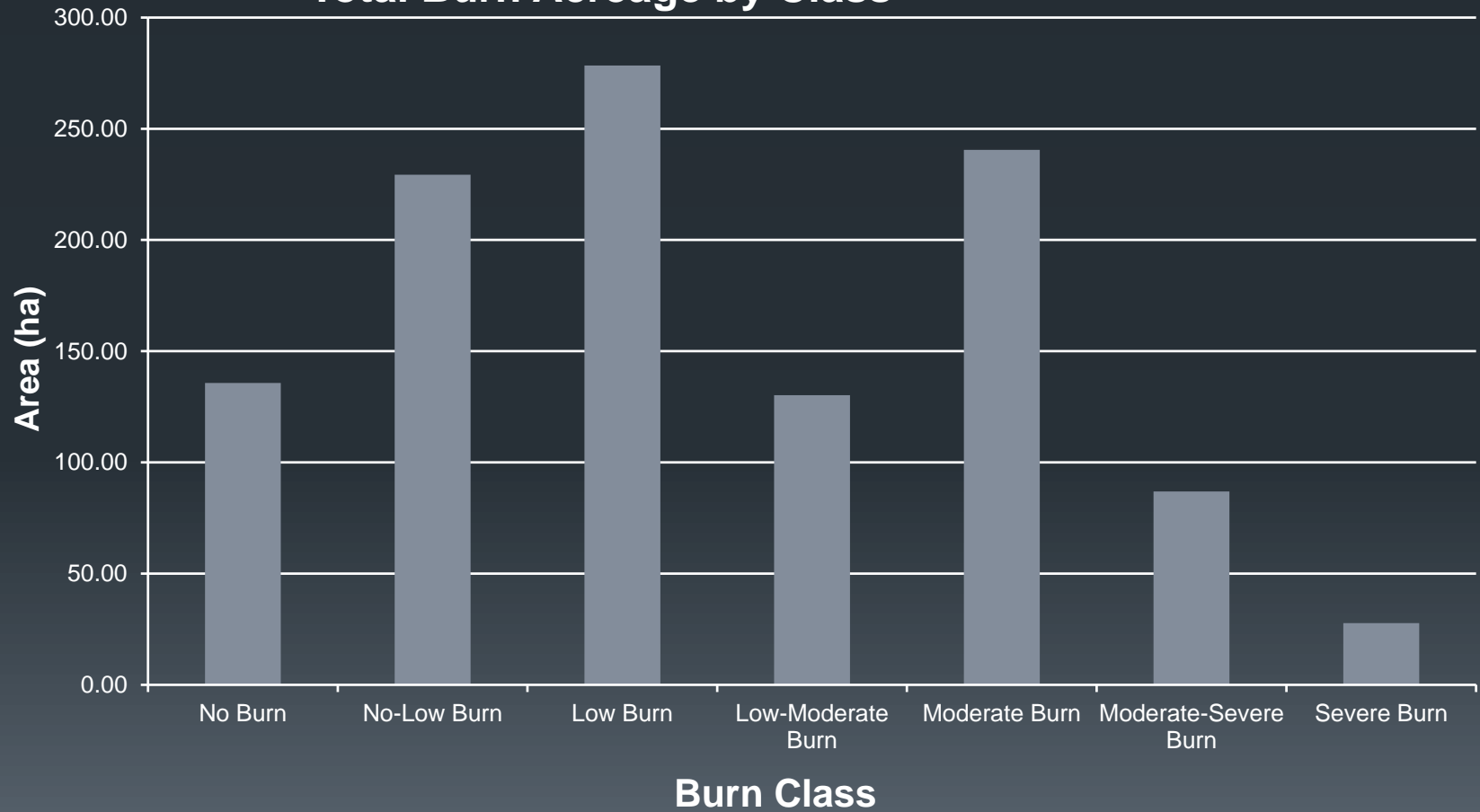
Results



Class_Names	Area_a	Color
Background	3137.33	Black
No burn	335.372	Dark Green
No - low burn	566.662	Light Green
Low burn	688.09	Light Orange
Low - moderate	321.806	Orange
Moderate burn	594.239	Red-Orange
Moderate - Severe	214.834	Red
Severe burn	68.4977	Dark Brown

Results

Total Burn Acreage by Class



Discussion

- Classification was conducted based on prior knowledge of the area and their appearance in the images
 - Did not have exact location of different burn types
 - Interpreter familiar with ground conditions
 - Consulted with BLM experts
- Intermediate classes (no-burn-low, low-medium, medium-high) were used for capturing uncertainty
- Next steps
 - Field verification in summer 2013
 - Update (shift the breakpoints) accordingly



Uses for the Technology

- BLM plans to use this map for management
 - Vegetation regrowth
 - Invasive species growth
 - Potential for soil erosion
- Other uses
 - Documents the extent of burn (snap shot in time) in 2011

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