

Mapping Fire Severity In Southern California Using Spectral Mixture Analysis Techniques

John Rogan

Janet Franklin

Thanks to: NASA-LCLUC Program Grant (2000)

Dar Roberts (UCSB)

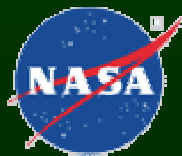
Lisa Levien (USFS)

Chris Fischer (CDF)



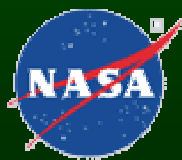
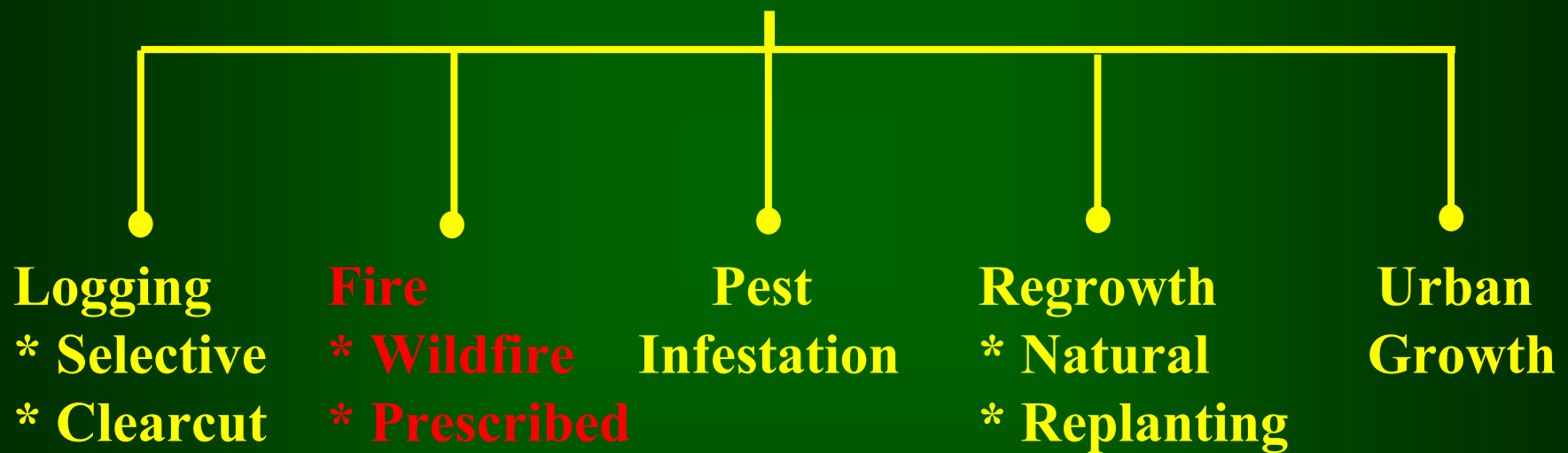
Introduction and Background

- The Importance of Mapping Fire
- Scales of Fire Research
 - Global
 - Regional
- Fire Severity
 - A measure of burn effects, based on conditions and ecological impacts following fire

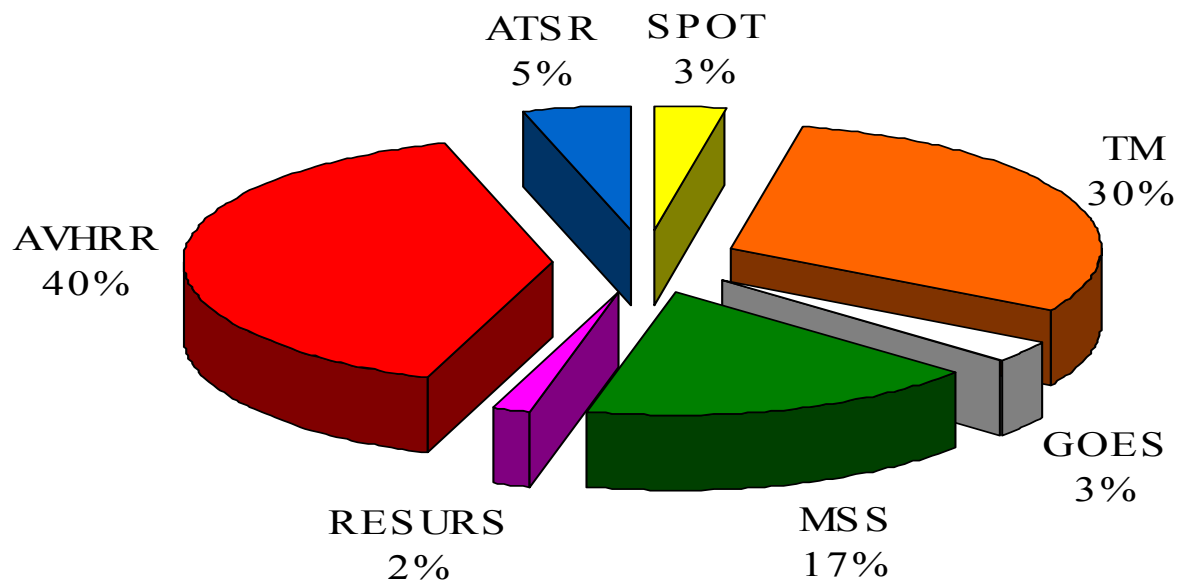


Scientific Implications

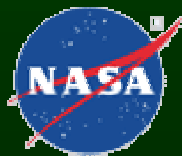
NASA LCLUC- Disturbance Monitoring



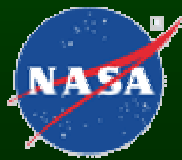
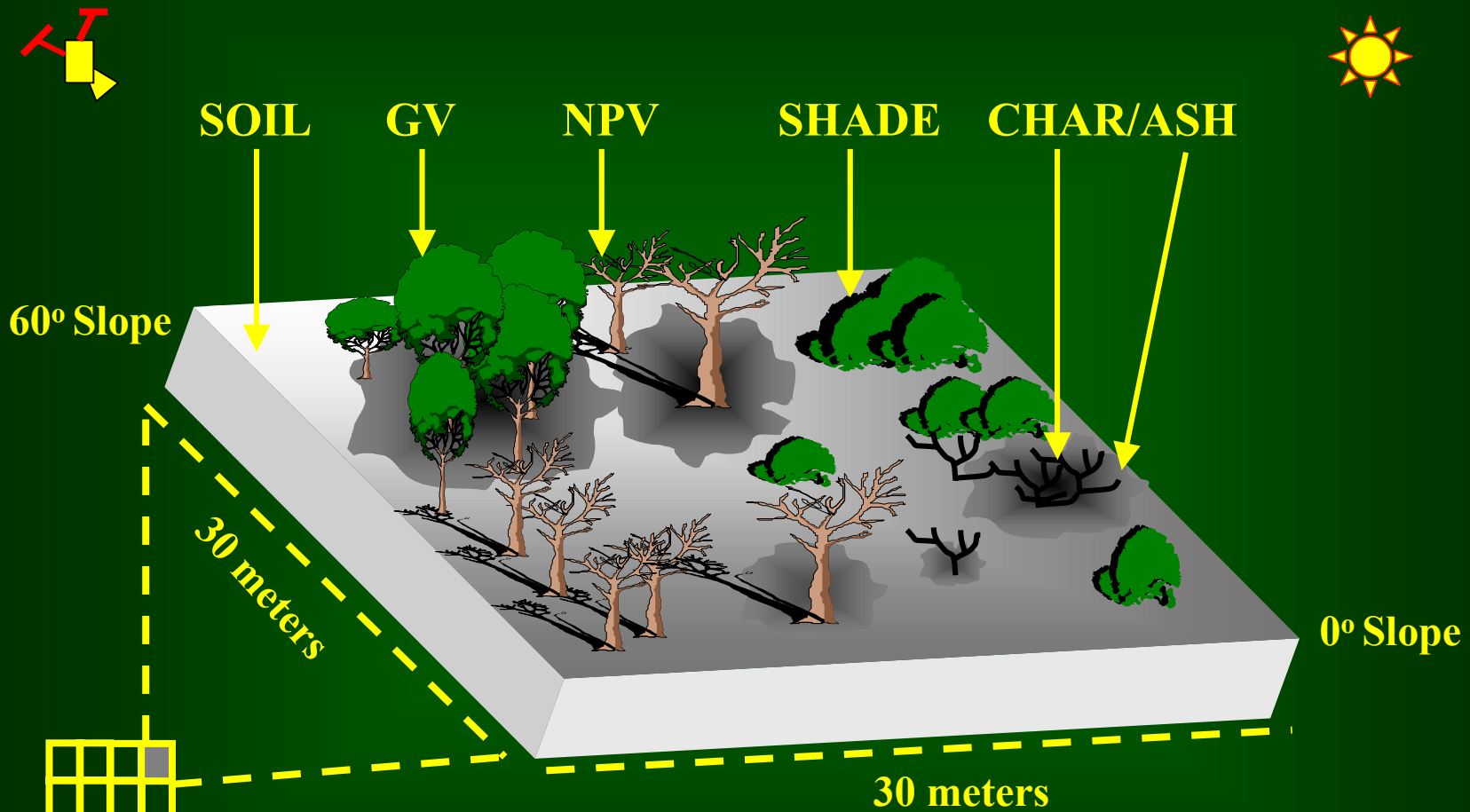
Frequency of Sensor Use in Fire Severity Mapping Studies



Over 50 articles surveyed

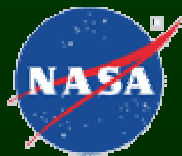


Scene Model of Fire Severity Mapping



Problems Encountered in Previous Studies

- Topographic effect
 - Spectral variability caused by illumination differences
- Mixed pixels
 - Sensor IFOV can contain a variety of fire severity classes
- Classification criteria
 - Fire severity classes can be unrealistic

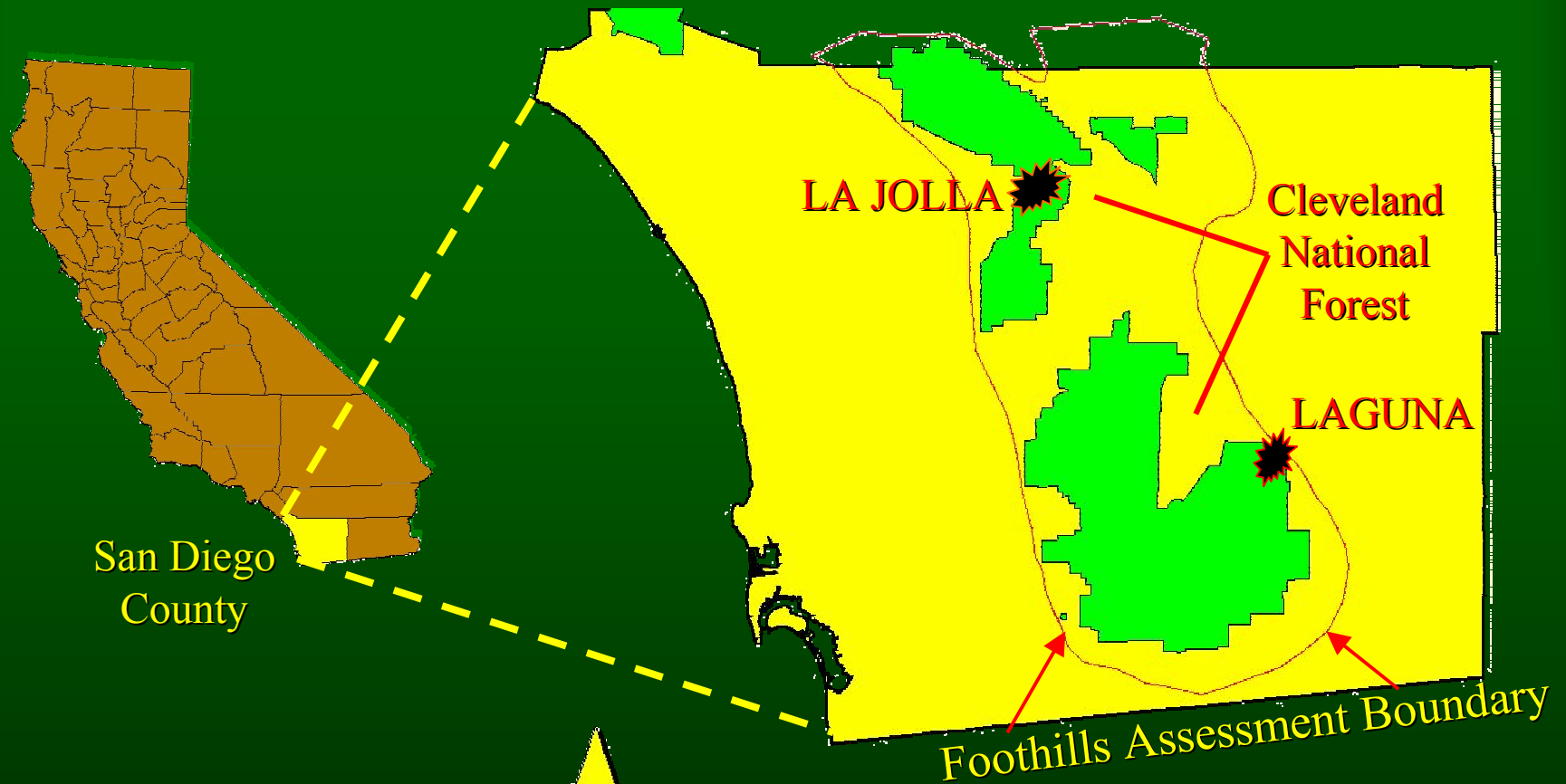


Research Objectives

- Examine the ability of **S**pectral **M**ixture **A**nalysis (**SMA**) to map five classes of fire severity in two diverse study areas
- Compare the decision tree classification accuracy of the SMA approach- within, and between study areas



Study Areas



San Diego
County

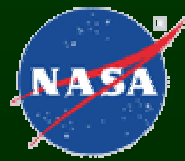
LA JOLLA

Cleveland
National
Forest

LAGUNA

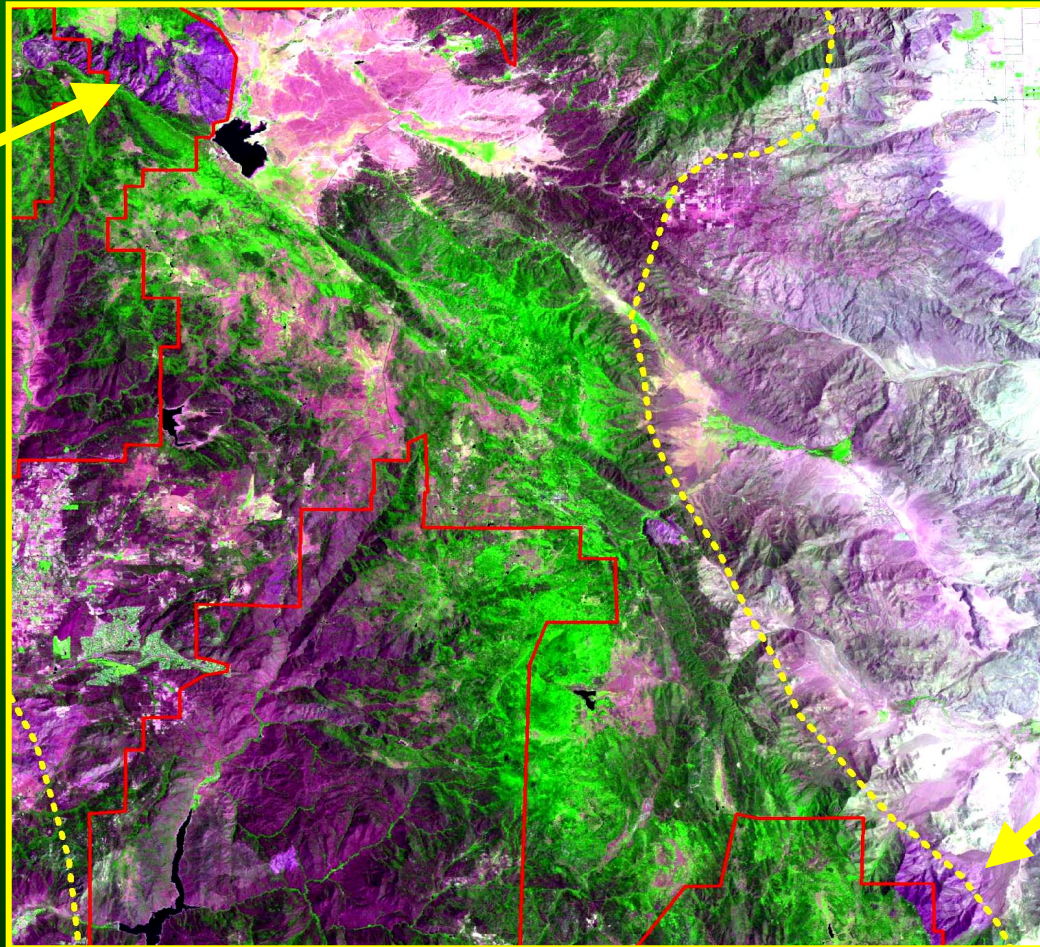
Foothills Assessment Boundary

0 30 60 Kilometers

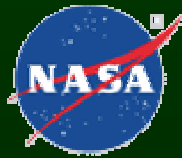


Study Areas

La Jolla Fire
Sept. 1999



Laguna Fire
Aug. 1999



La Jolla Fire



La Jolla Fire



Laguna Fire

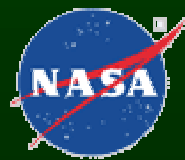


Laguna Fire



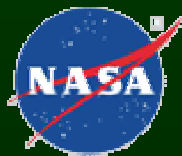
Data

- June 2000 LANDSAT ETM image (p40/r37)
 - Converted to reflectance values
- Spectral library (Roberts et al., 1999)
- In situ field data (collected May-June 2000)



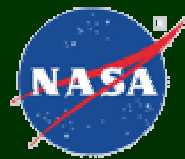
Classes of Burn Severity

Unburned vegetation	UV
Bare Soil	BS
Mixed burned pixels with LOW vegetation cover	MBPLV
Mixed burned pixels with HIGH vegetation cover	MBPHV
Severe burn	SB



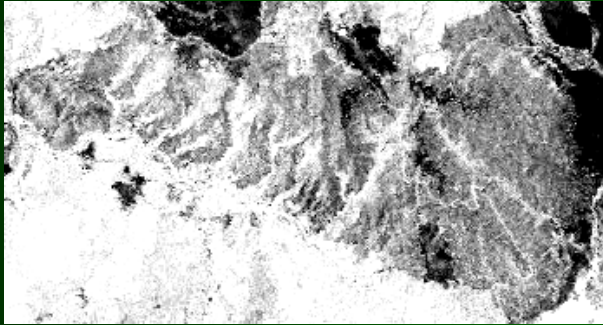
Methods

- Endmember selection
 - GV, BV, Shade, Soil
- Spectral unmixing
 - Evaluation based on RMS
- Shade Normalization
 - Normalized GV, BV, Soil
- Decision tree training
- Map accuracy assessment

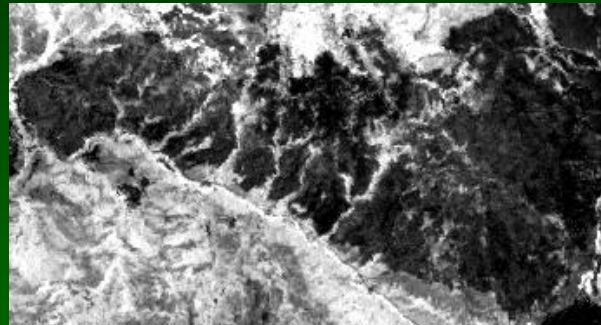


La Jolla Fire Fractions

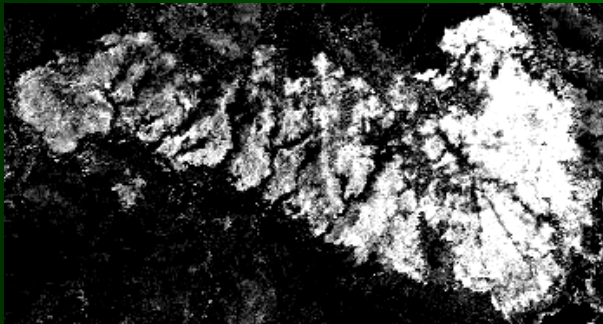
Shade



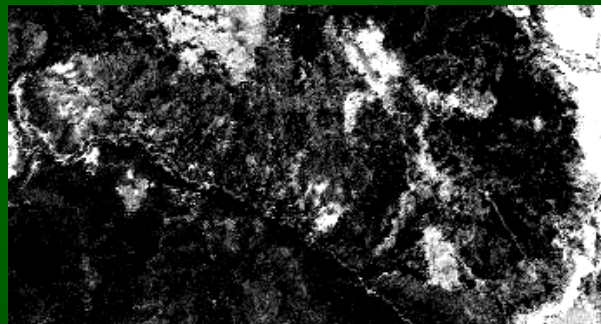
GV



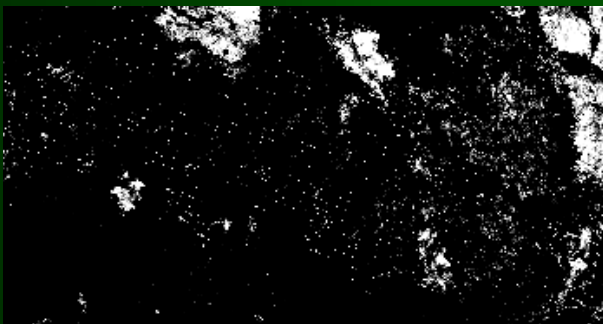
BV







Soil

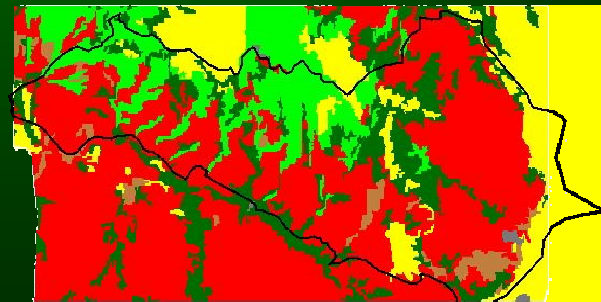


RMS



Veg Map

-  Hardwood
-  Grassland
-  Conifer
-  Chaparral
-  Scrub

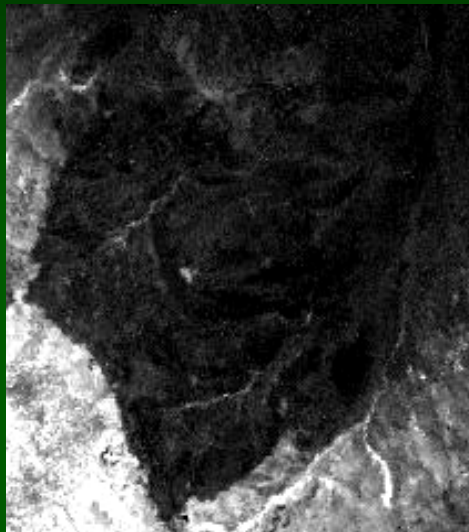


Laguna Fire Fractions

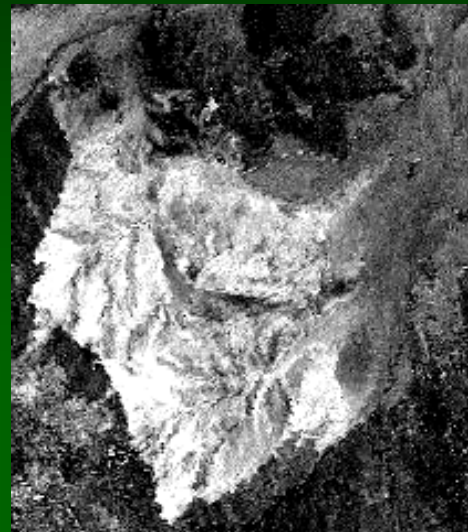
Shade



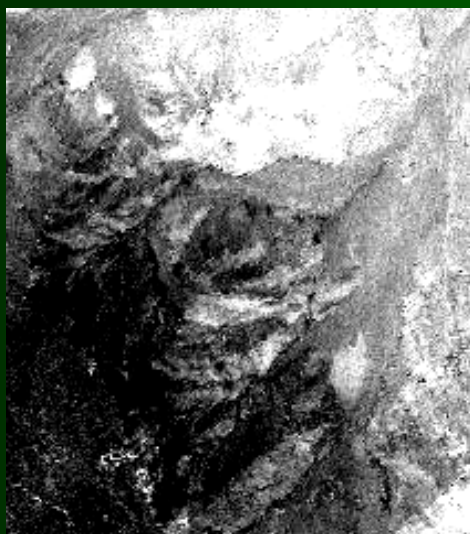
GV



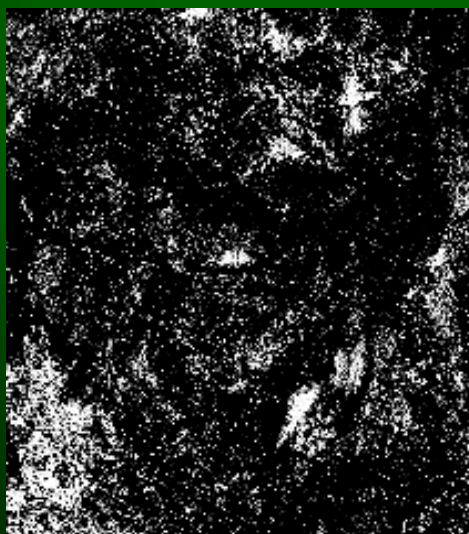
BV



Soil

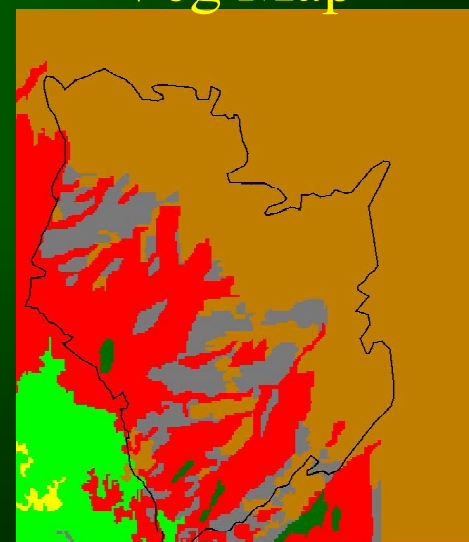


RMS



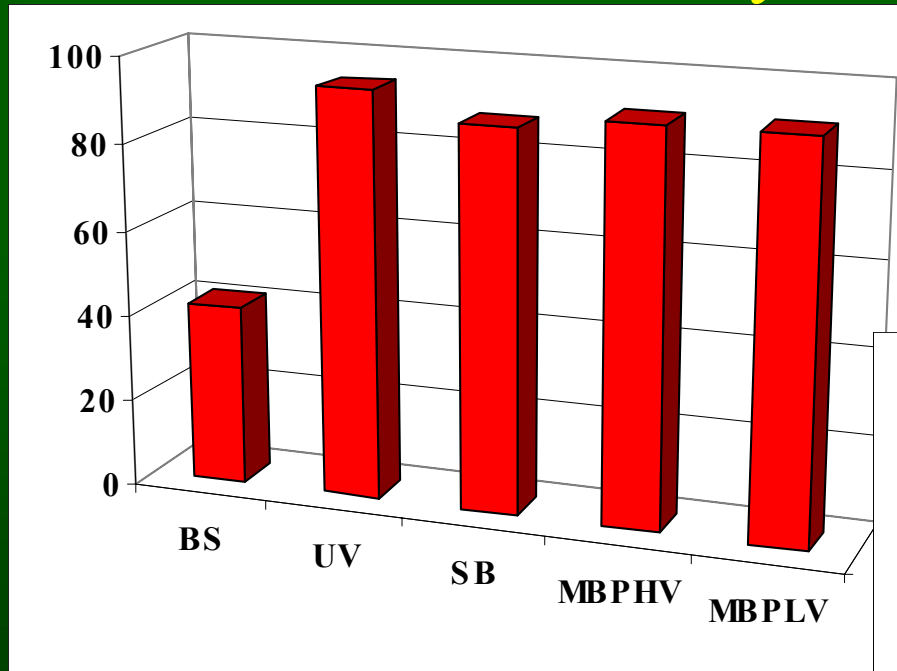
Veg Map

- Hardwood
- Grassland
- Conifer
- Chaparral
- Scrub

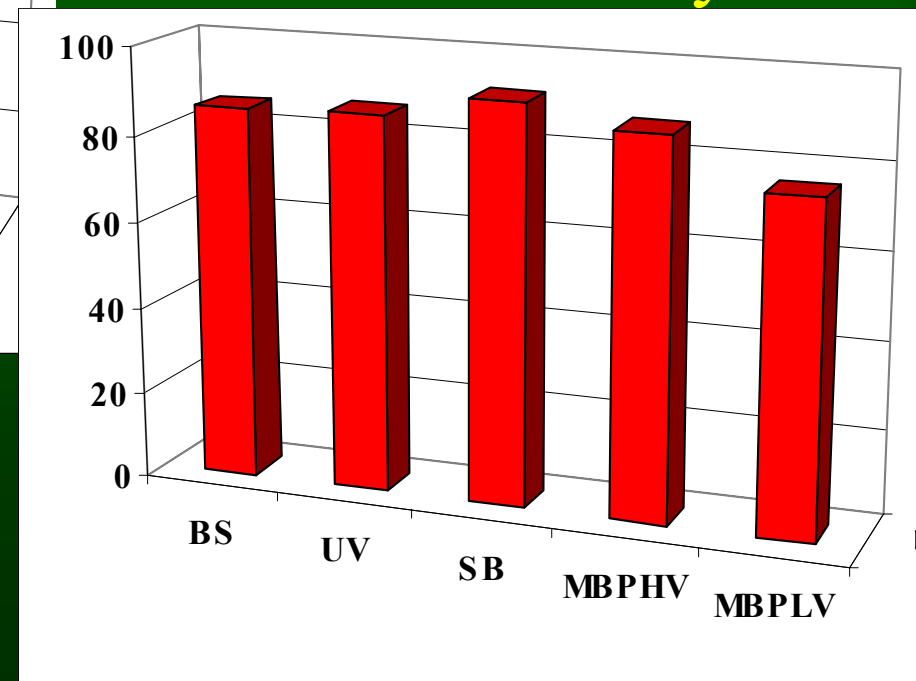


Results- La Jolla Fire

Producer's Accuracy



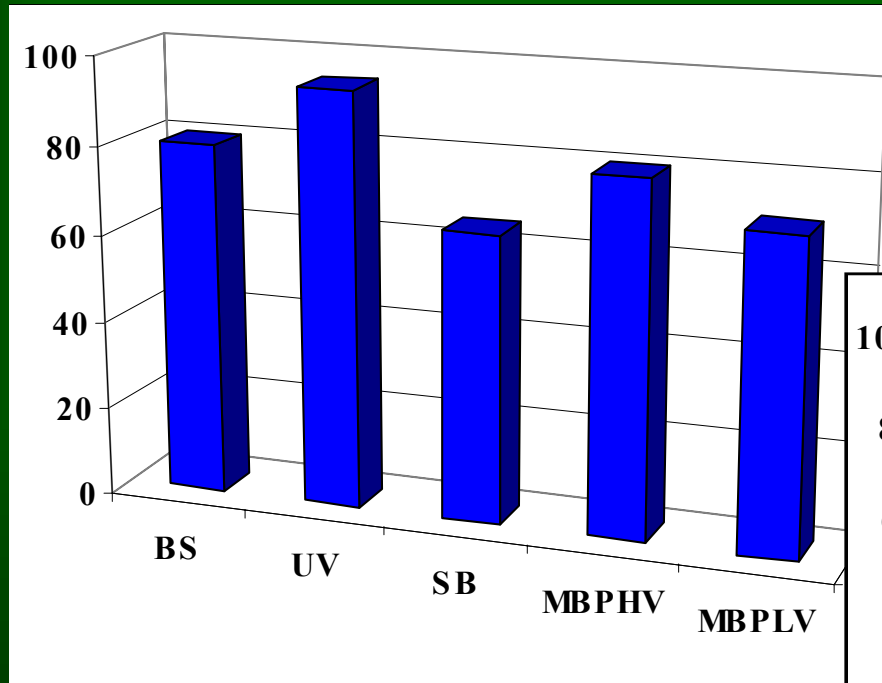
User's Accuracy



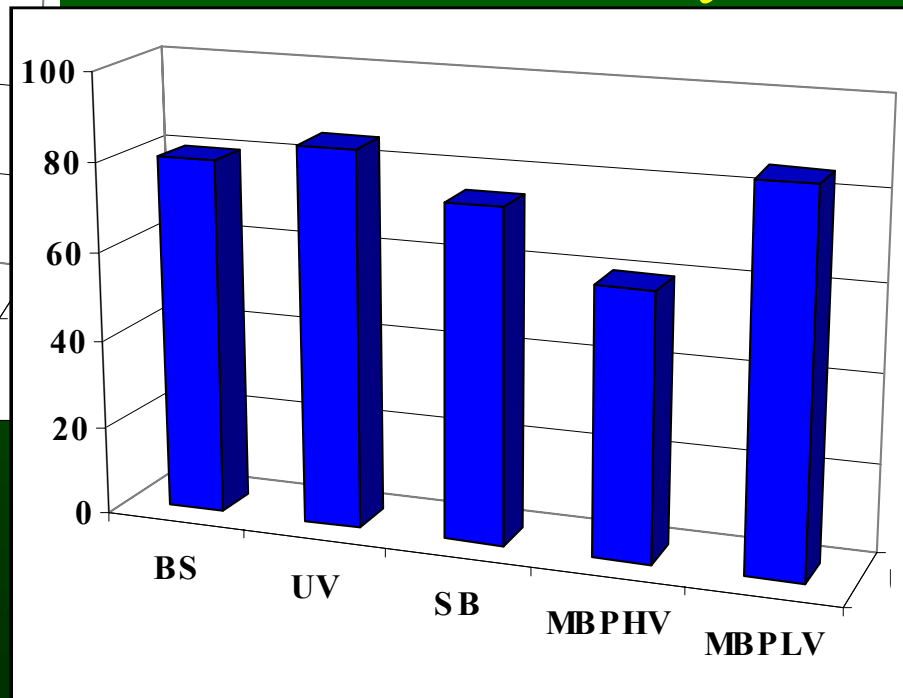
Overall Accuracy = 85 %

Results- Laguna Fire

Producer's Accuracy



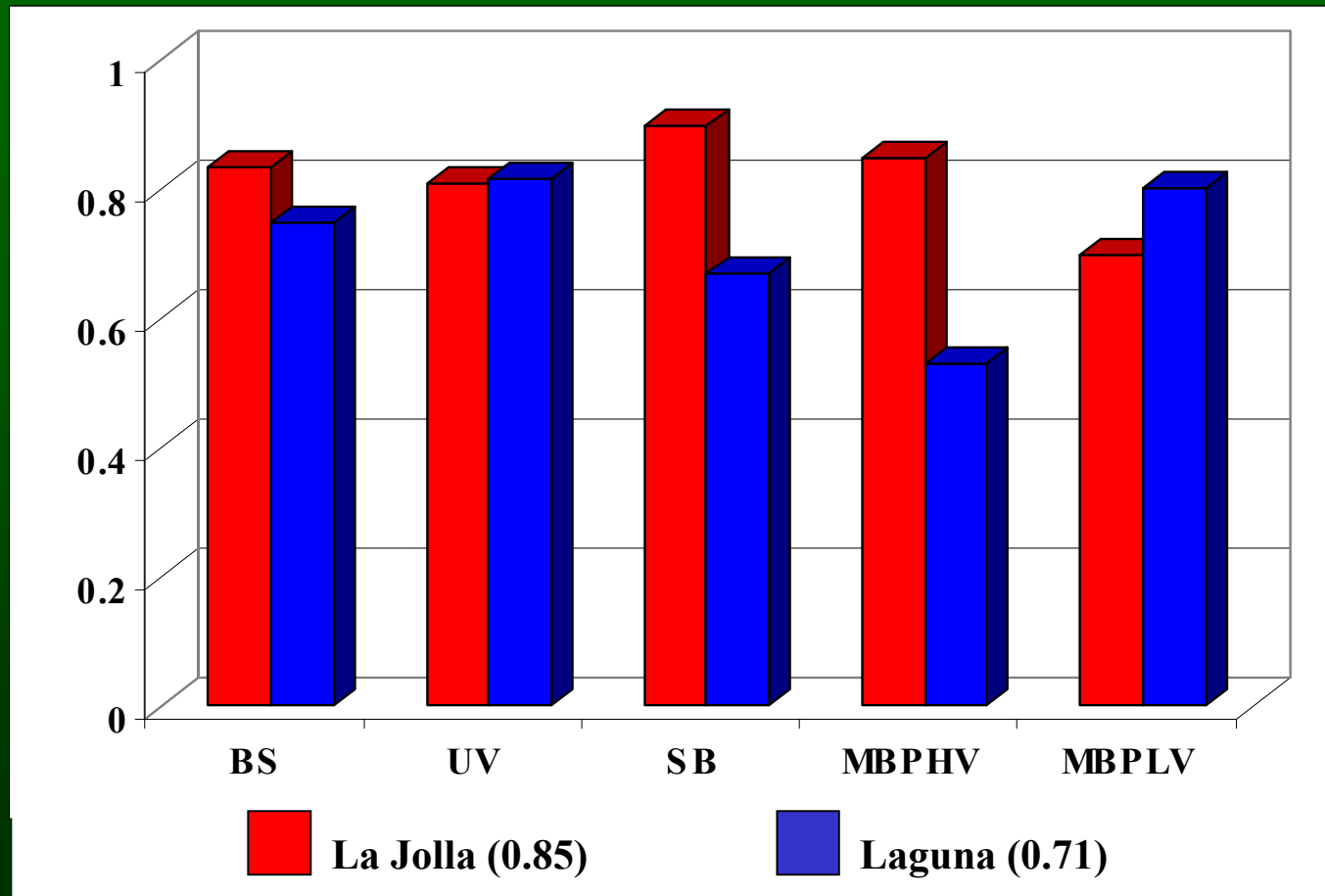
User's Accuracy



Overall Accuracy = 77 %

Results- Comparison Between La Jolla and Laguna Fires

Kappa Accuracy



Summary Conclusions

- A decision tree classification approach resulted in high fire severity classification accuracy, based on normalized SMA fraction images
- Accuracy comparison between classes
- Accuracy comparison between study areas
- Future use and limitations of this approach

