

Wildfire risk and treatment effectiveness of protecting highly valued resources and assets with fuels management



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Project Goals

SCIENCE

- Expand the knowledge base regarding risk-based assessment of fuel treatment effectiveness
- Better establish linkages at the nexus of fuel treatment planning, suppression response planning, and wildfire incident decision making

DELIVERY

Yield significant improvements in:

- How fuel treatments are designed and implemented
- How incident managers understand and respond to wildfire-treatment interactions

Science Delivery



**Wildland Fire Management
Research, Development & Application**
Integrating Science, Technology and Fire Management



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US Forest Service

Caring for the land and serving people



Fire & Aviation Management

Motivation

Risk-Based Decision Support



WFDSS: Wildland Fire Decision Support System

FSPro RAVAR: Rapid Assessment of Values-at-Risk

Zaca Fire, CA

4 August 2007 - T1_E_070803_1_Mh

Major Values-at-Risk per
FSPro Fire Spread Probabilities:
14 days as of 3 August 2007

Fire Perimeter as of 3 August

MOSS last 8 days

4 August

3 August

Previous 6 days

Past Fires 1994-2006

FSPro Fire Spread Probability

> 80 %

60 - 80 %

40 - 60 %

20 - 40 %

5 - 20 %

1 - 5 %

< 1 %

FSPro Spread Barriers

RAWS Stations

Building Clusters - Ventura Co.

Improved Parcels - Santa Barbara Co.

Water: Dams > 100ft

Water Supply: Intakes

Water Treatment Plants

Water Pipeline - Aqueduct - Canal

Powerlines

Industrial Plant

Power Pylon

Communication Towers

Oil & Gas Transmission Lines

Airports

Airport Runways

Police Stations

Hospitals

Fire Stations

Schools

HAZMAT: Mines

HAZMAT: Superfund Sites

HAZMAT: Hazardous Waste

Other Landmarks

Interstates

Major Roads

Railways

County Boundary

Jurisdiction

Private

State

BLM

BOR

USFS

Inventory Roadless

Designated Wilderness

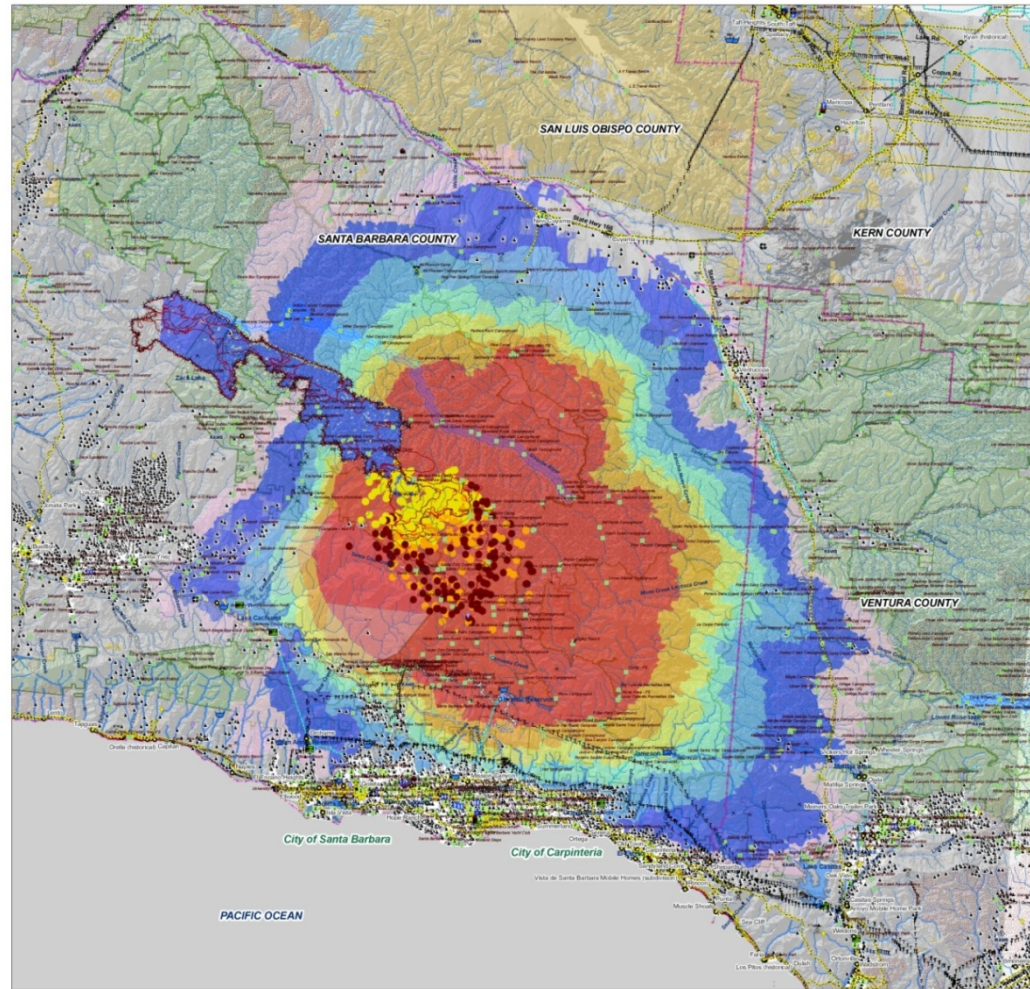
Wild-Scenic-River

Building Clusters - Santa Barbara Co.

*Building Clusters represent the center of parcels where county assessor records indicate taxable improvements are present. One or more structures and other improvements may exist proximate to these point locations.

CAUTION: Defer to air photos or local knowledge for exact structure and other feature locations.

Prepared by Kevin Probst (907) for USFS (907) Property Services Unit, Missoula, 408-338-1107 - kprobst@fs.fed.us

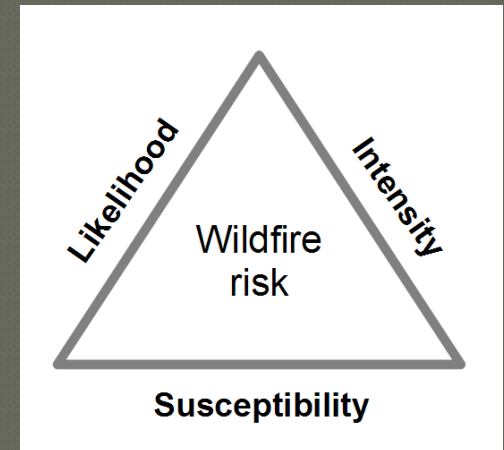


1:120,000

0 5 10 20 Miles

Risk-informed fuels management

- How do fuel treatments:
 - affect spatial patterns of wildfire likelihood and intensity?
 - affect the exposure of highly valued resources and assets (HVRAs) to risk factors?
 - affect the response of HVRAs to wildfire?



Analyzing treatment success

- How does fuel treatment effectiveness vary with:
 - Geographic characteristics
 - Treatment type & age
 - Fire weather conditions
 - Spatiotemporal wildfire-treatment interactions
 - Suppression operations

Basic Approach

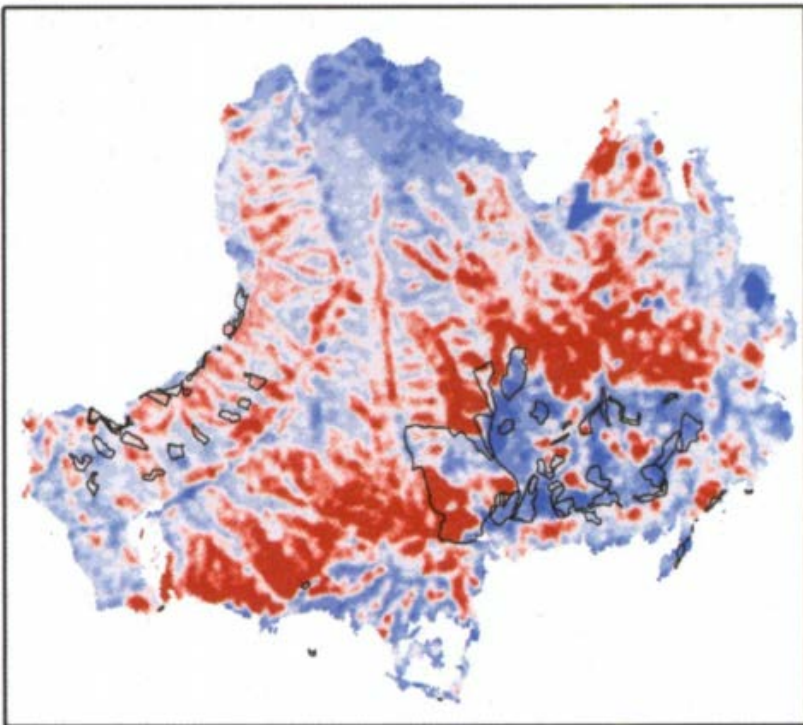
- ◉ Earth Observation data
 - Landsat: burn severity & fuels
 - MODIS: active fire detection & progression maps
- ◉ Stochastic wildfire simulation
- ◉ Geospatial analysis
- ◉ Exposure & risk assessment

E.O. Data >> Treatment Effects

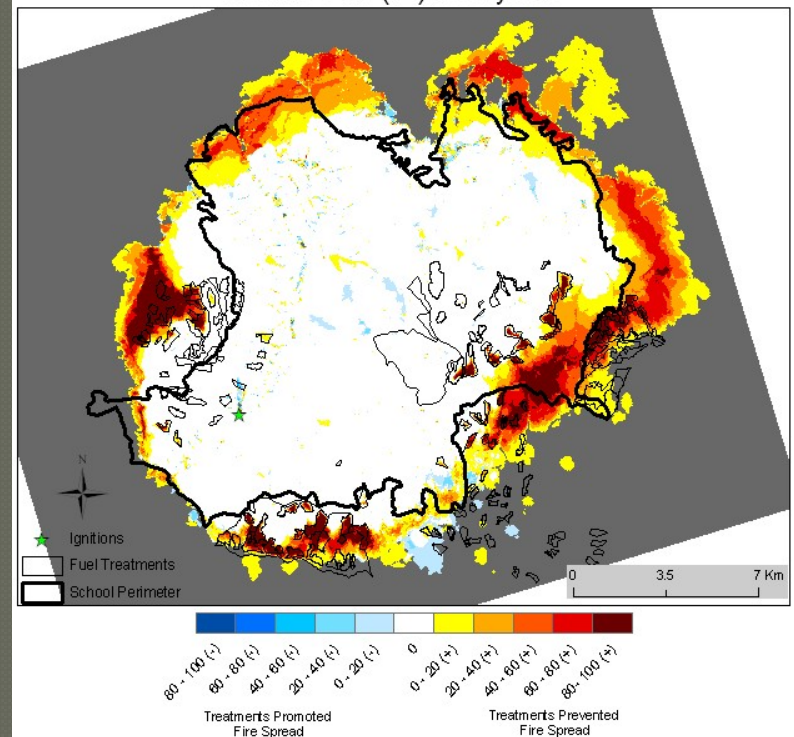
ON-SITE:
SEVERITY

OFF-SITE:
PROBABILITY & INTENSITY

B) School fire

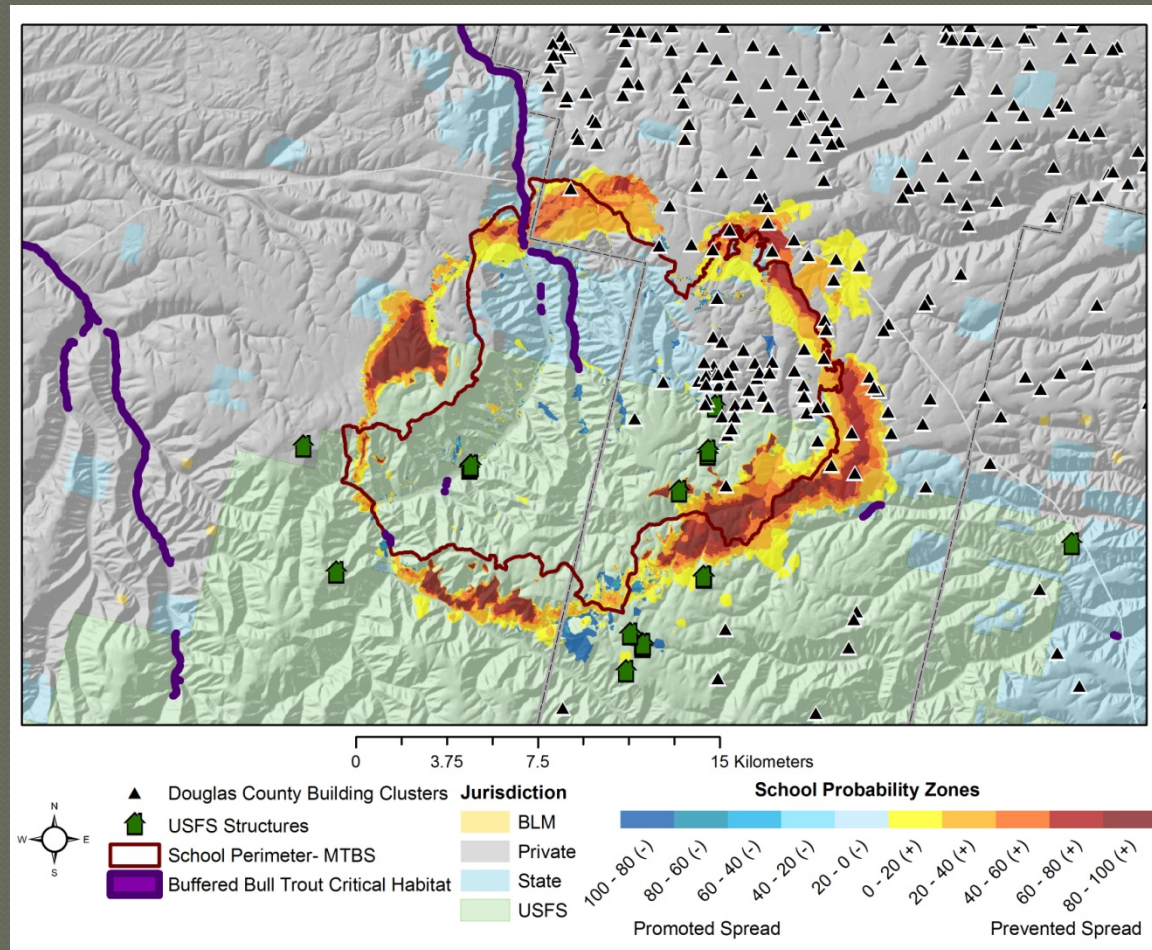


School Fire (f2) Analysis1

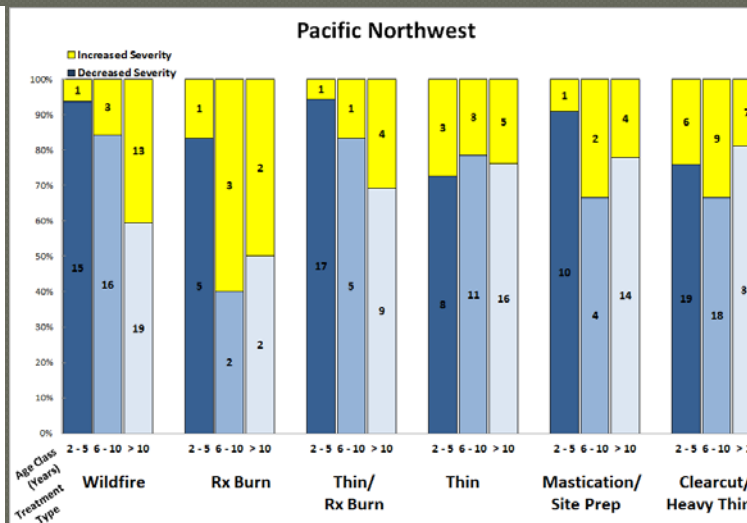
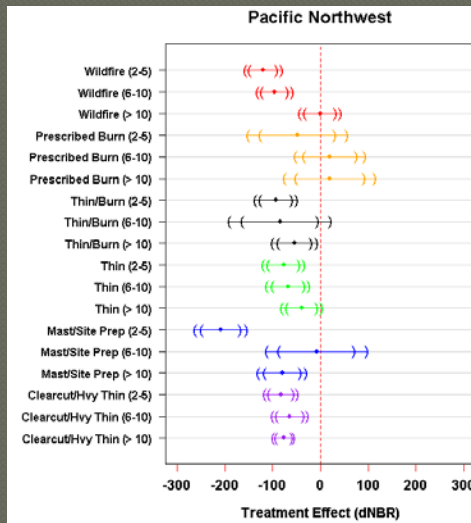


Map Created on August 5, 2010 (FTEUS)

Fuel Treatments & Exposure

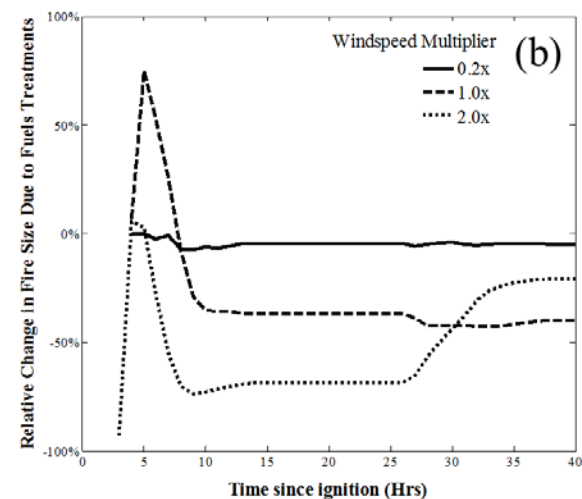
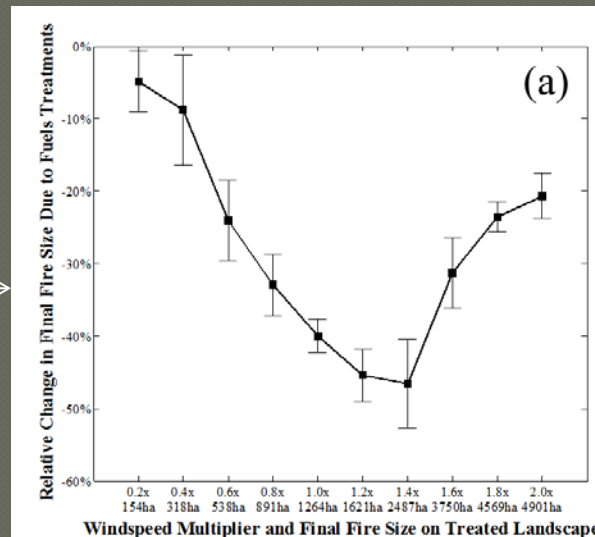


Results: Fire Behavior



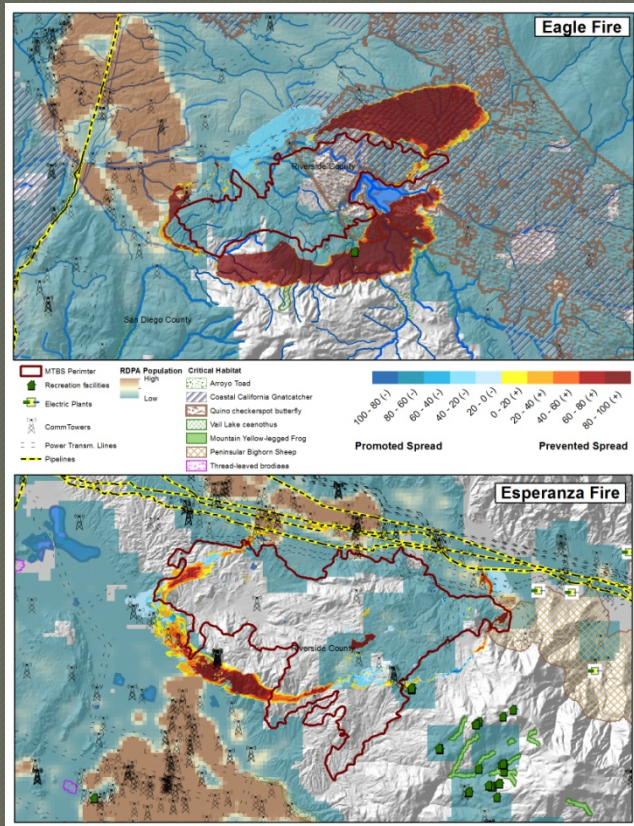
How do treatments of varying types and ages affect burn severity?

How sensitive are fuel treatment impacts on fire size to different wind speeds?

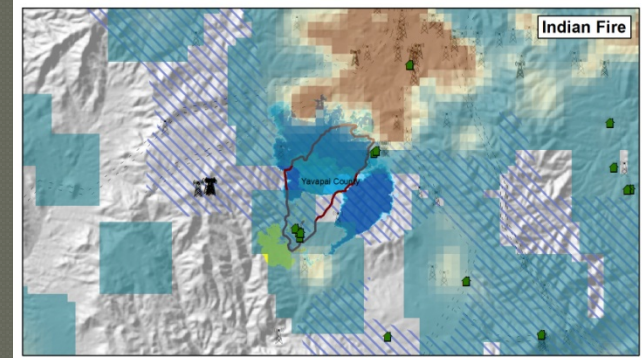
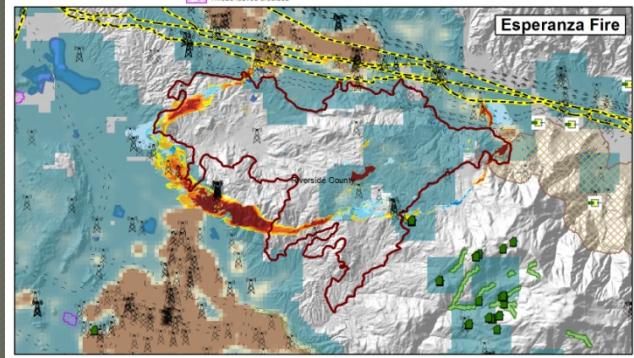
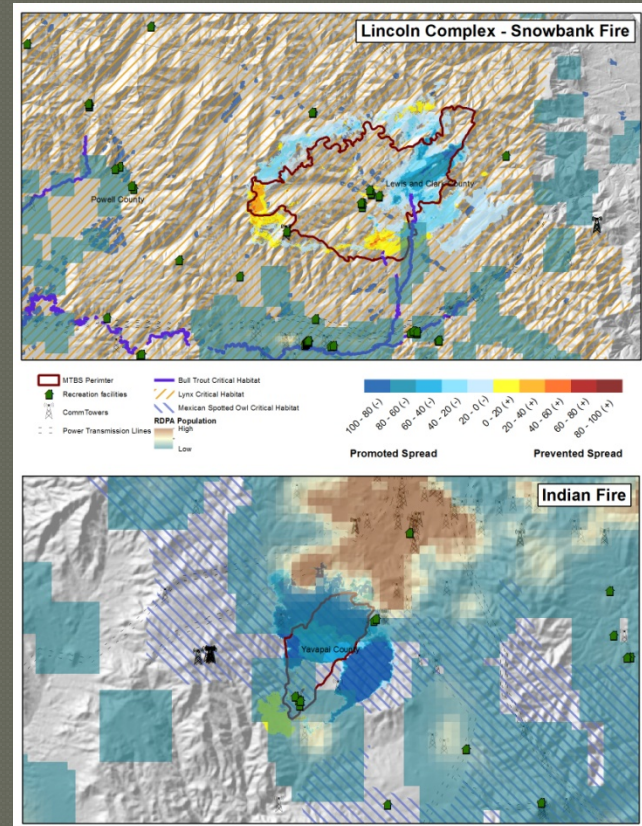


Results: HVRA Exposure

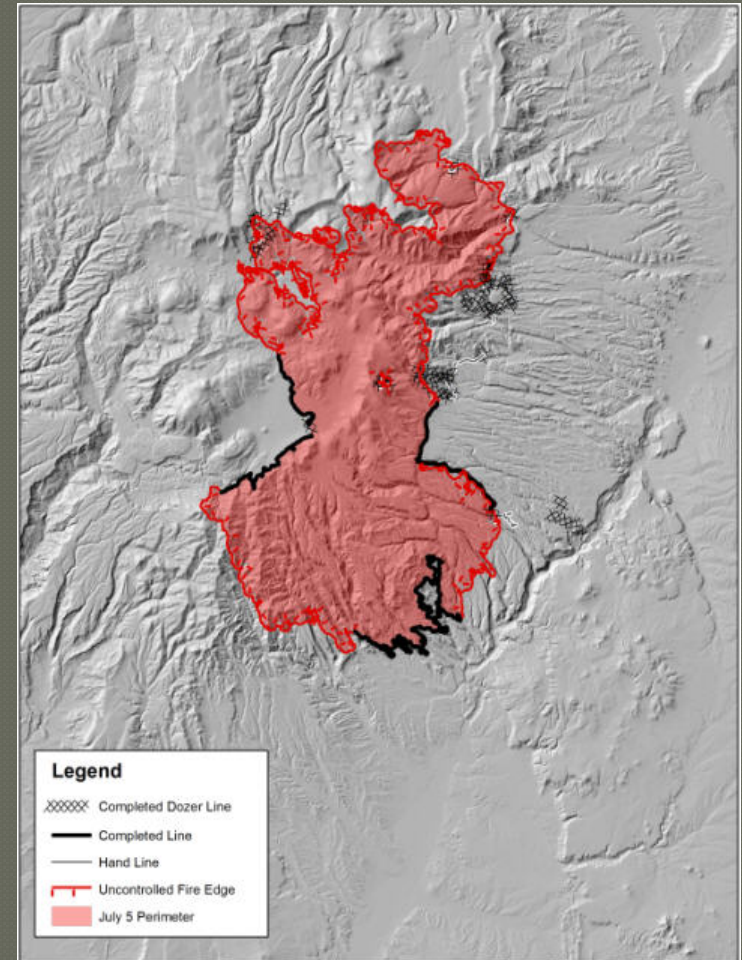
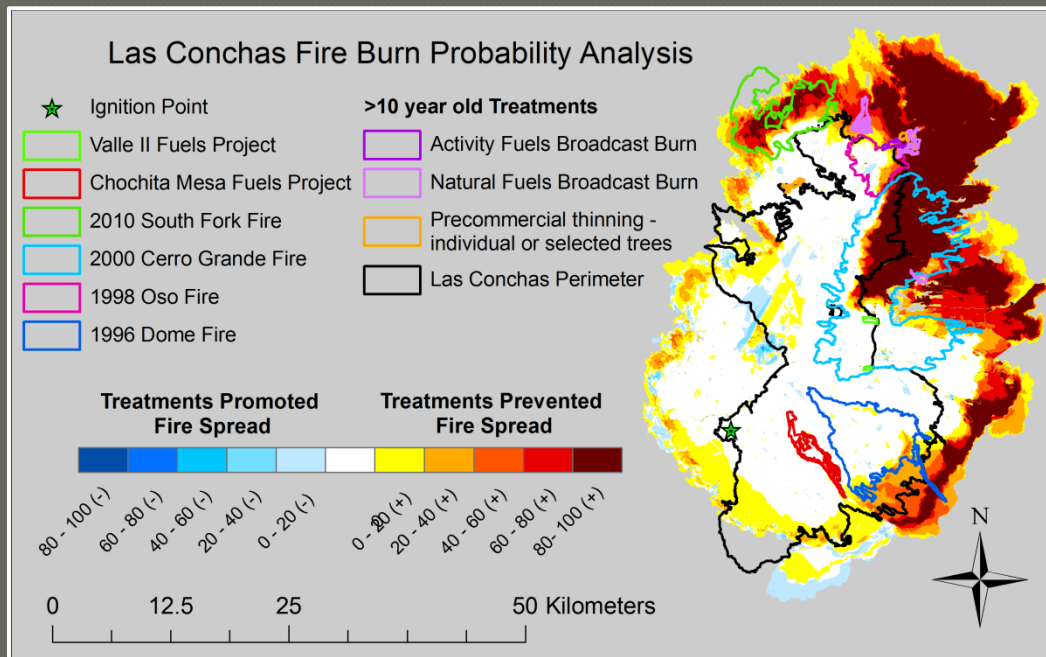
PREVENTED SPREAD



PROMOTED SPREAD



Results: Suppression Actions

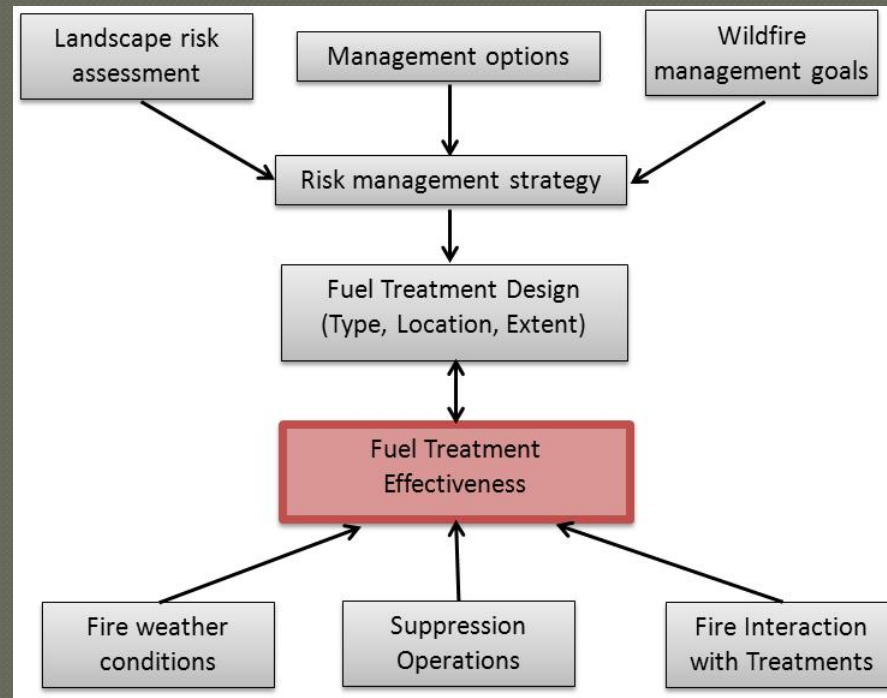


Ongoing & Future Work

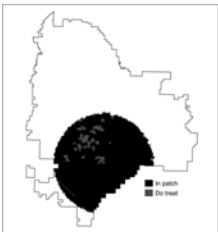

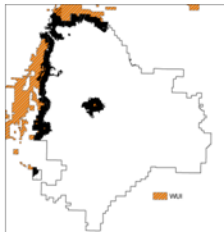
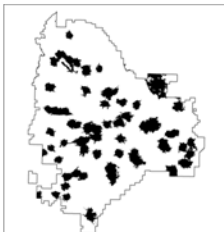
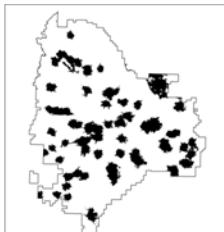
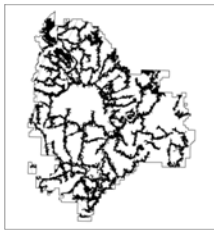
- ◉ Expanding analysis of treatment effectiveness
 - HVRA response to fire and avoided losses
 - Temporal dynamics; windows of suppression opportunity
 - Suppression effectiveness and safety
 - Incident decision making

Planned deliverables

- Treatment Design
- Treatment Evaluation
- Treatment Decision Process



Questions?

Motivation	Restoration	Protection	Protection	Protection	Restoration	Protection
Fire regime	Low severity (+ fire)	Mixed severity (+/- fire)	Mixed severity (+/- fire)	High severity (- fire)	High severity (- fire)	High severity (- fire)
Pattern of values	Dispersed (large trees)	Dispersed and prevalent (low density WUI, T&E)	One clump	Clumpy	Any	Low or none
Treatment Strategy	Create large contiguous areas of low hazard (minimum treatment for maximum area)	Strategic (SPLATs/SPOTs)	Localized protection (targeted treatments)	Localized protection (targeted treatments)	Restore natural fire barriers	Defensible fuel breaks along roads and other barriers
Treatment system	Low hazard fire containers	Treatment optimization model (FlamMap; TOM)	Defensible fuel breaks	Defensible fuel breaks	Strategic restoration	High hazard fire containers
Spatial treatment pattern						

Problem Structuring

Problem
Framing

Define
Objectives

Define
Evaluation
Criteria

Problem Analysis

Define
Alternatives

Evaluate
Consequences

Identify Key
Uncertainties

Tradeoff
Analysis

Decision Point

Identify
Preferred
Alternative

Implementation & Monitoring

Implement
Preferred
Alternative

Monitor