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

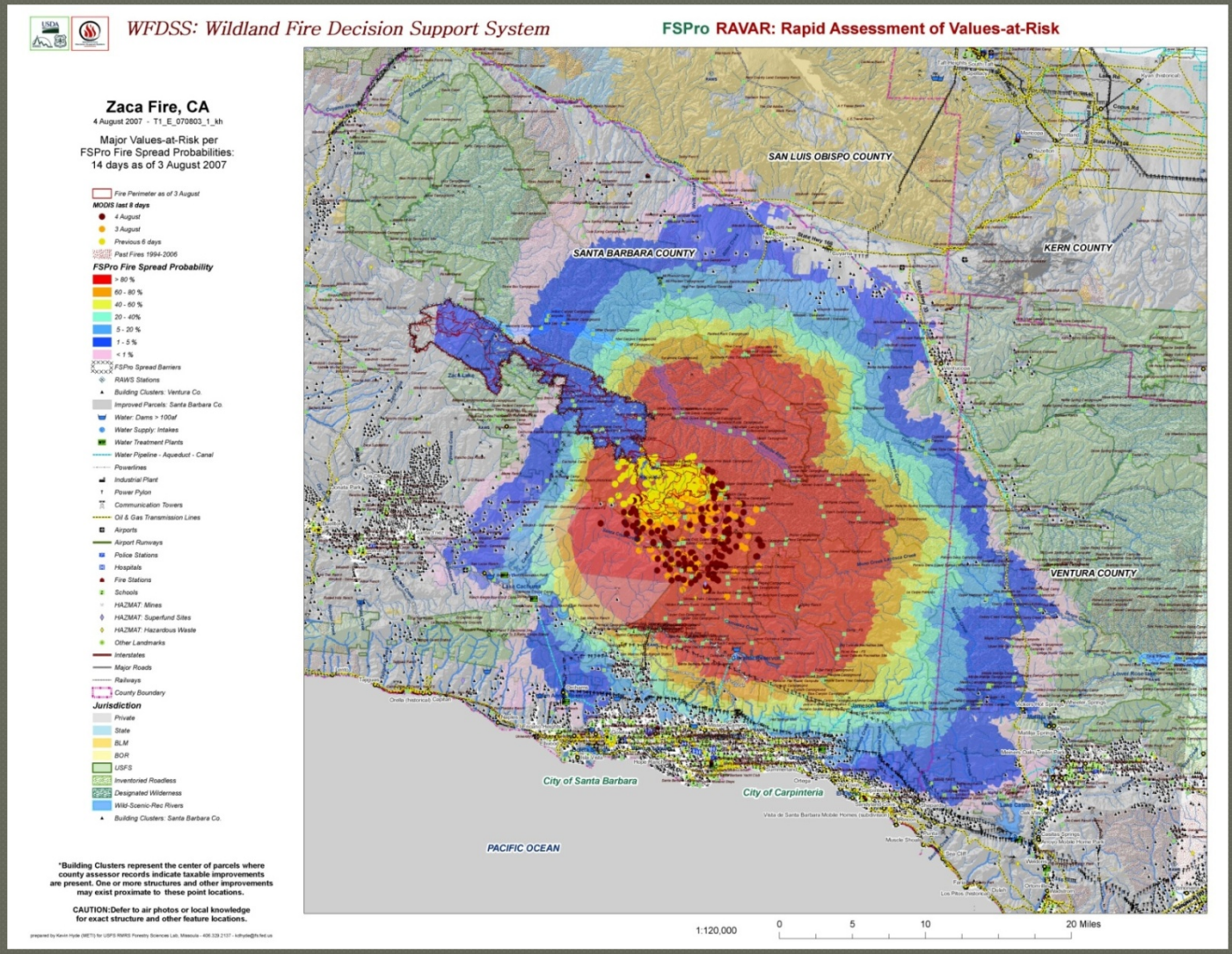
Science Delivery

Wildland Fire Management Research, Development & Application

Integrating Science, Technology and Fire Management

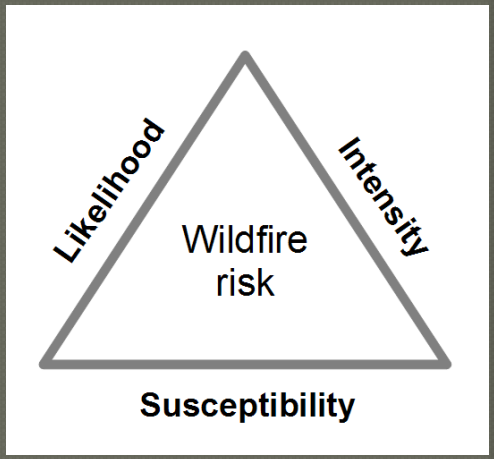
Motivation

Risk-Based Decision Support



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

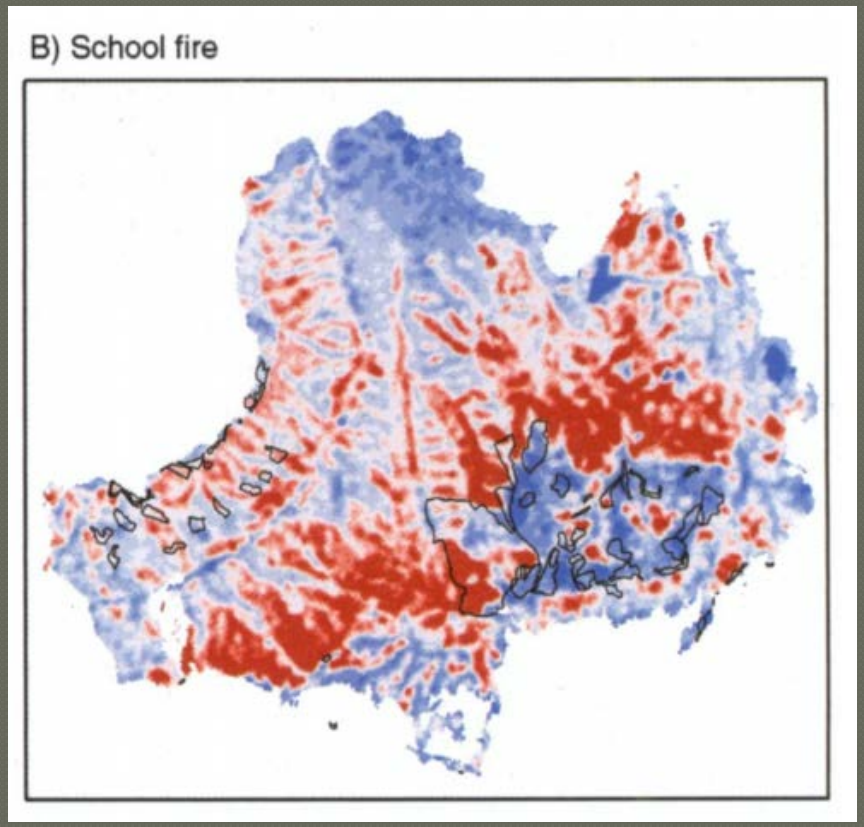
- How does fuel treatment effectiveness vary with:
  - Geographic characteristics
  - Treatment type & age
  - Fire weather conditions
  - Spatiotemporal wildfire-treatment interactions
  - Suppression operations

Basic Approach

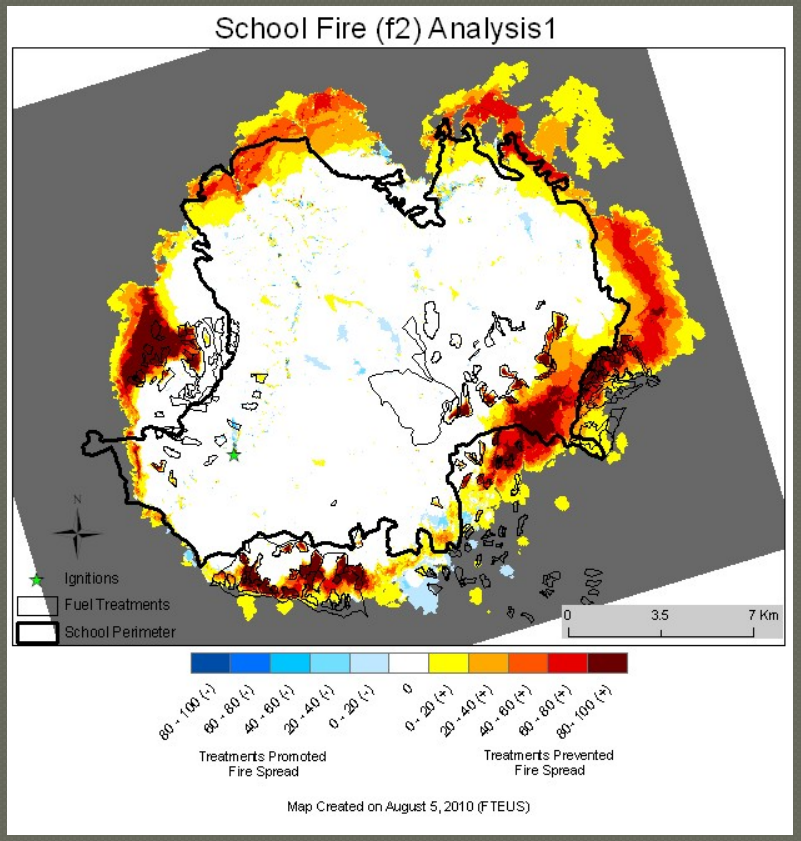
- Earth Observation data
  - Landsat: burn severity & fuels
  - MODIS: active fire detection & progression maps
- Stochastic wildfire simulation
- Geospatial analysis
- Exposure & risk assessment

E.O. Data >> Treatment Effects

ON-SITE: SEVERITY

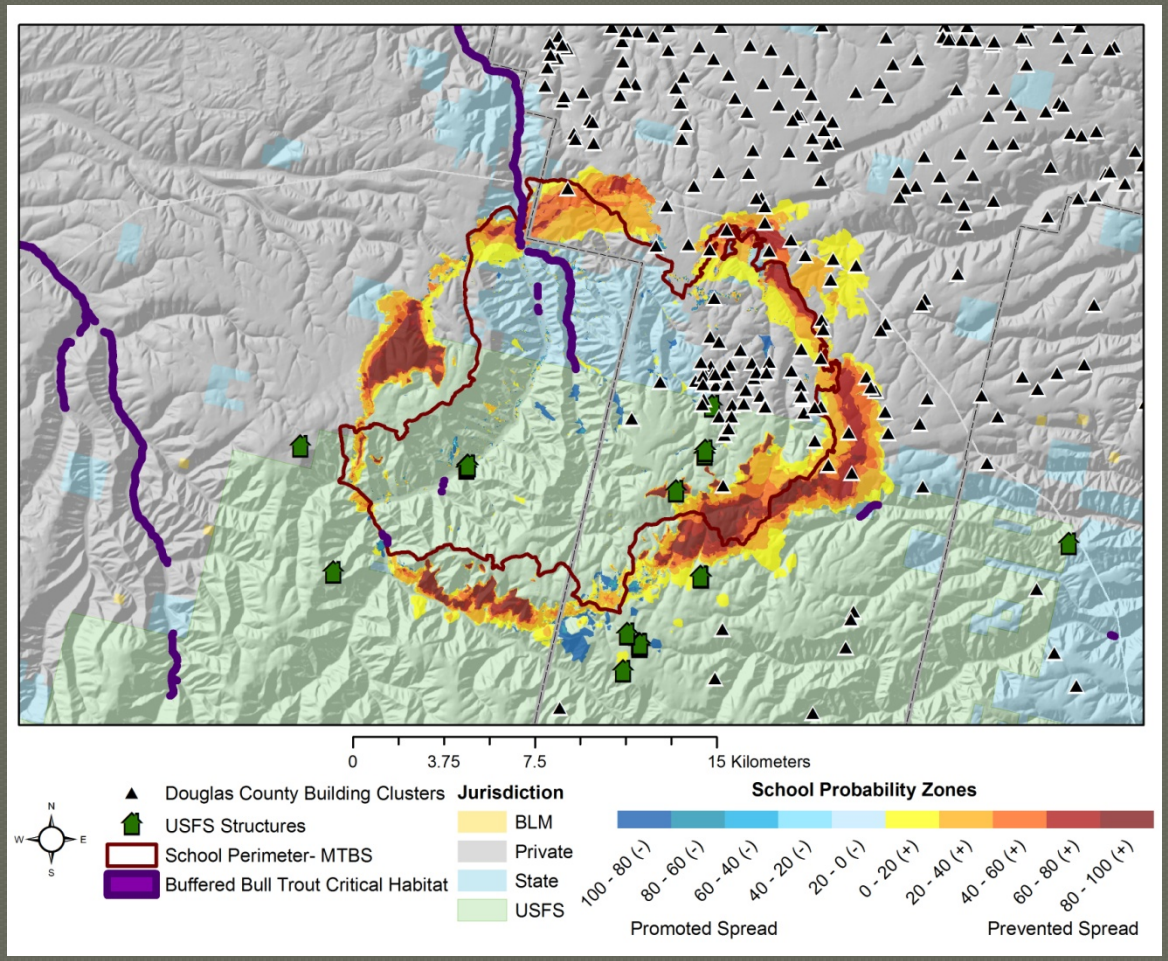


OFF-SITE: PROBABILITY & INTENSITY

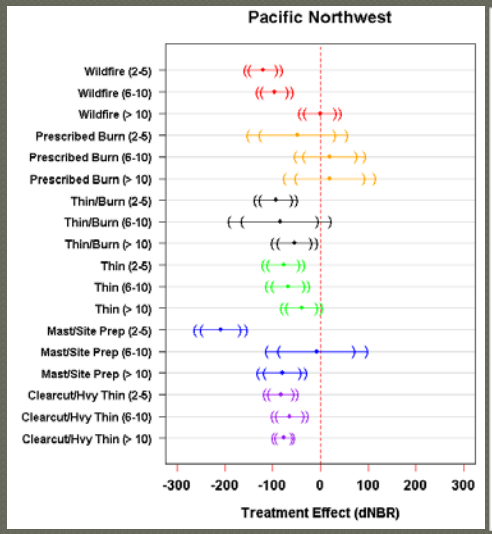


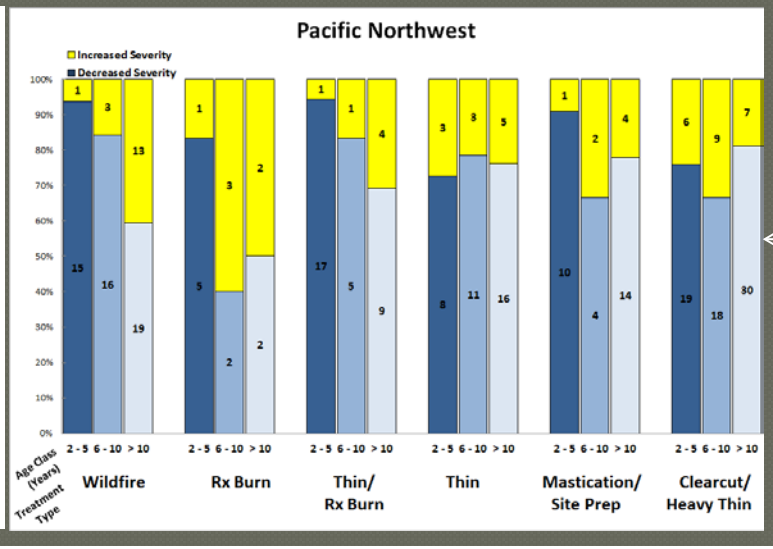
Wimberley et al. 2009

Fuel Treatments & Exposure



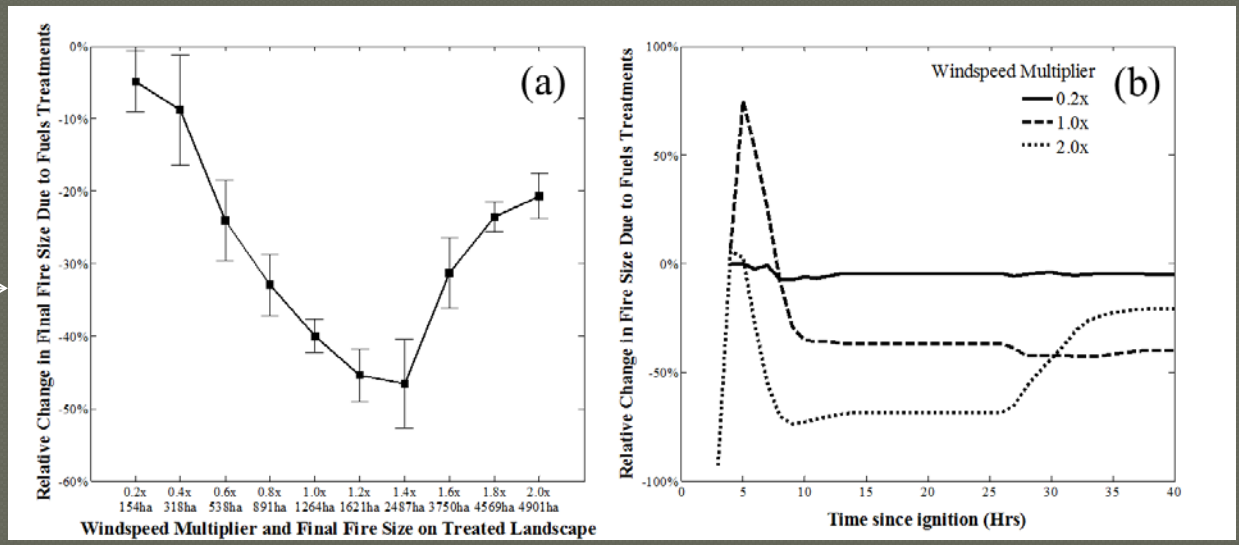
Results: Fire Behavior





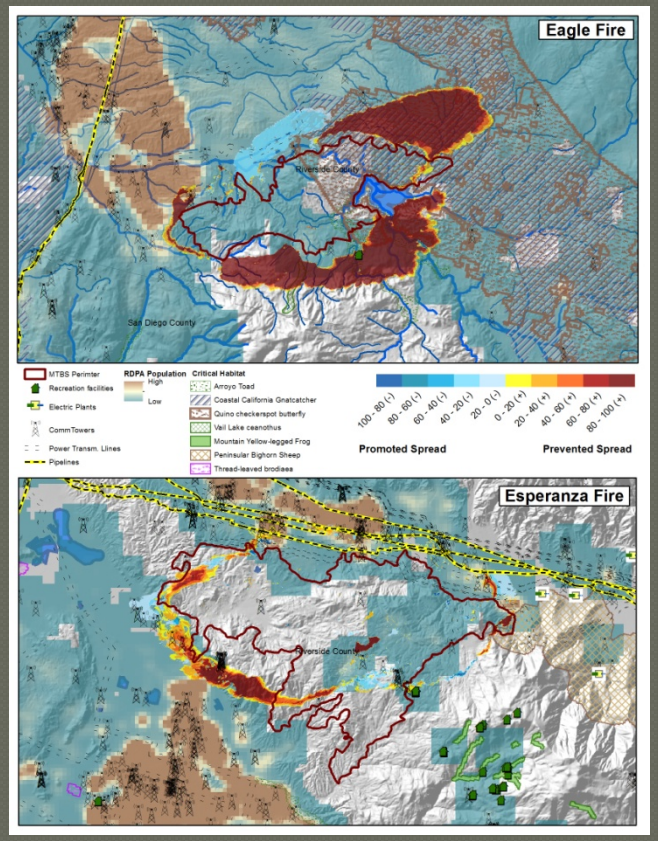
How do treatments of varying types and ages affect burn severity?

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

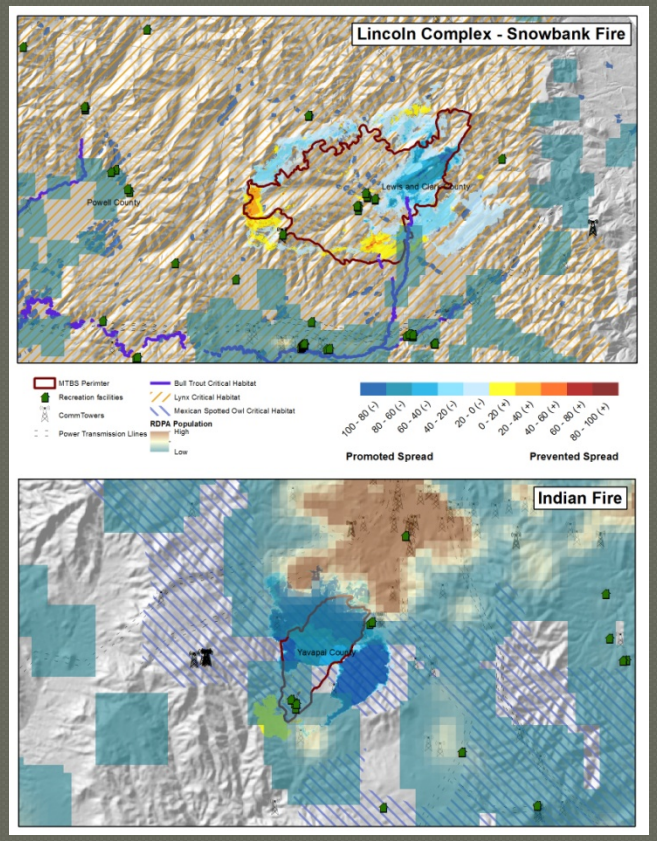


Results: HVRA Exposure

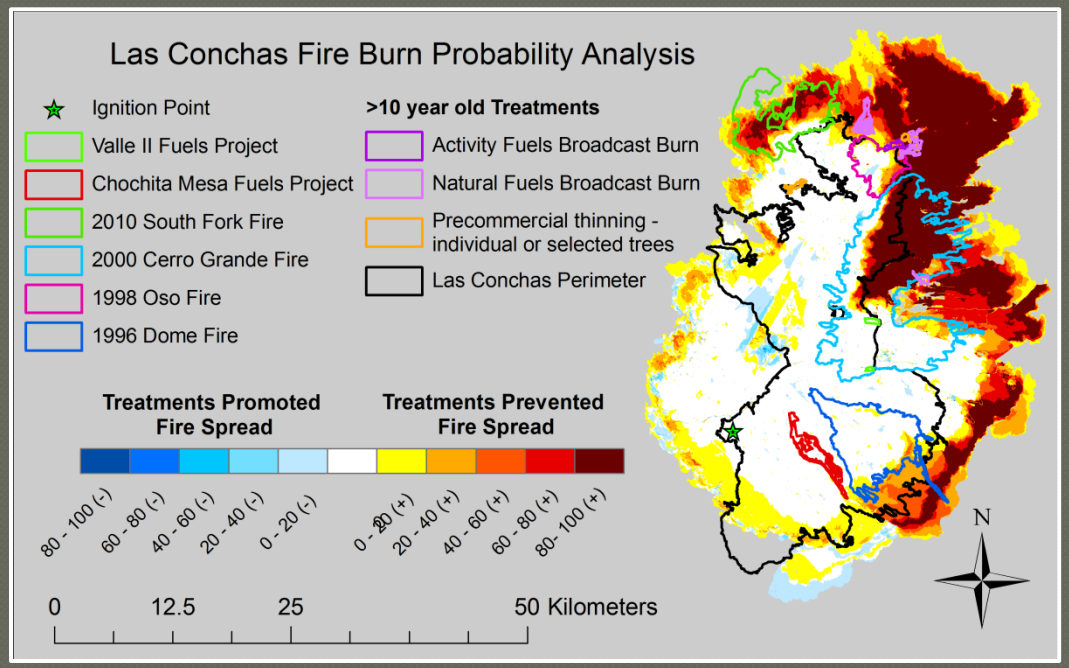
PREVENTED SPREAD

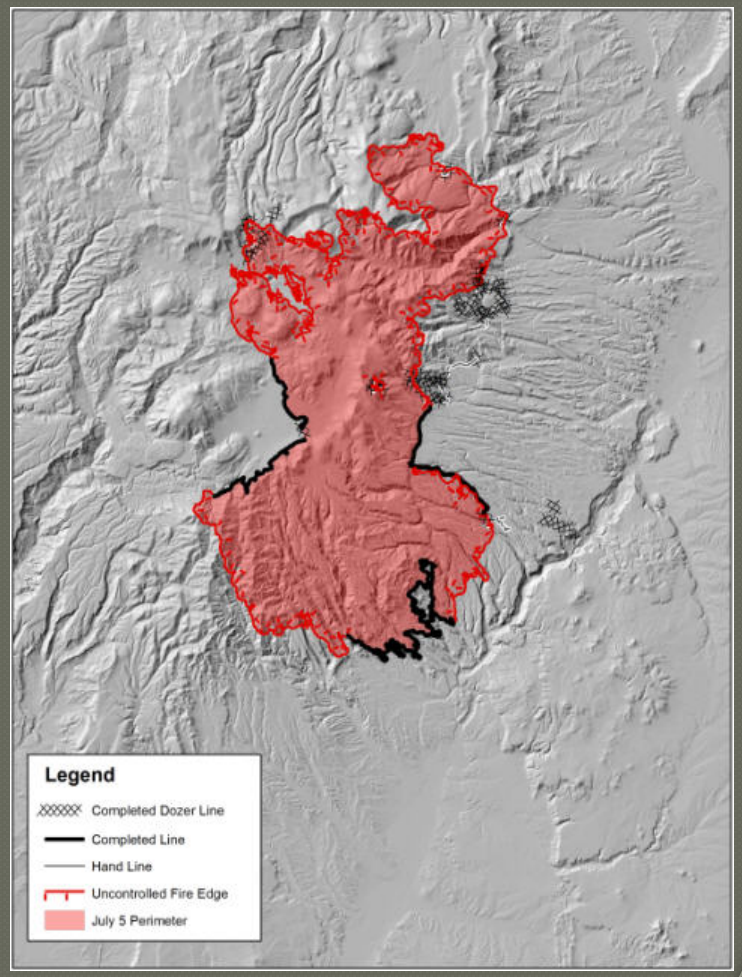


PROMOTED SPREAD



Results: Suppression Actions



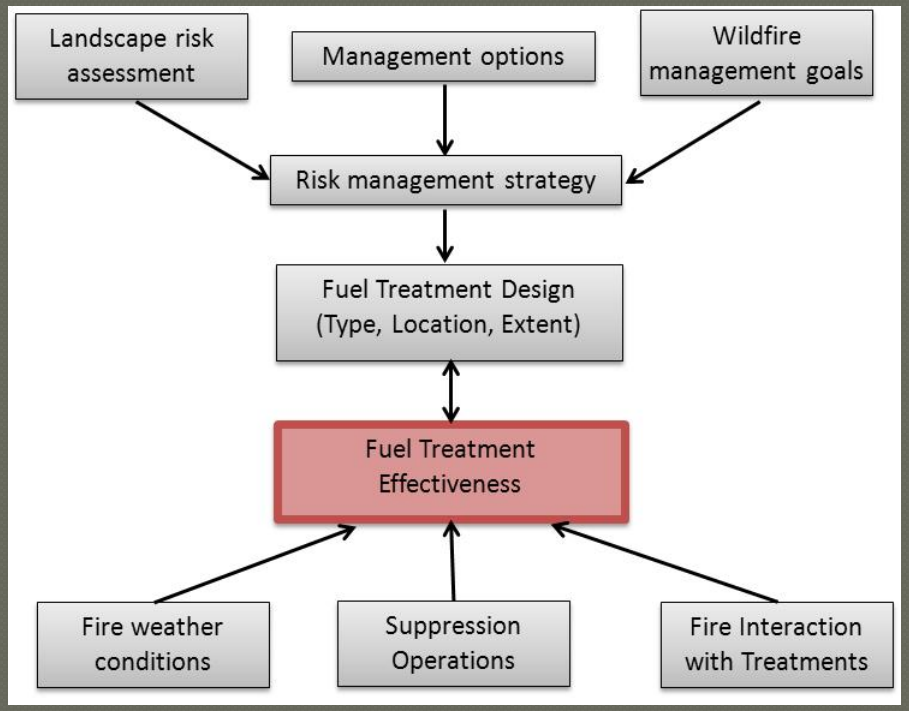


Ongoing & Future Work

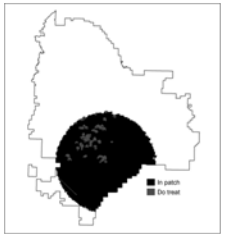
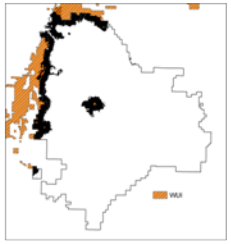
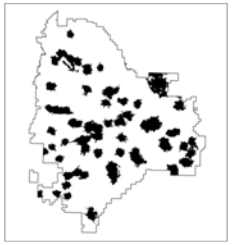
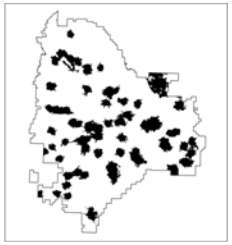
- Expanding analysis of treatment effectiveness
  - HVRA response to fire and avoided losses
  - Temporal dynamics; windows of suppression opportunity
  - Suppression effectiveness and safety
  - Incident decision making

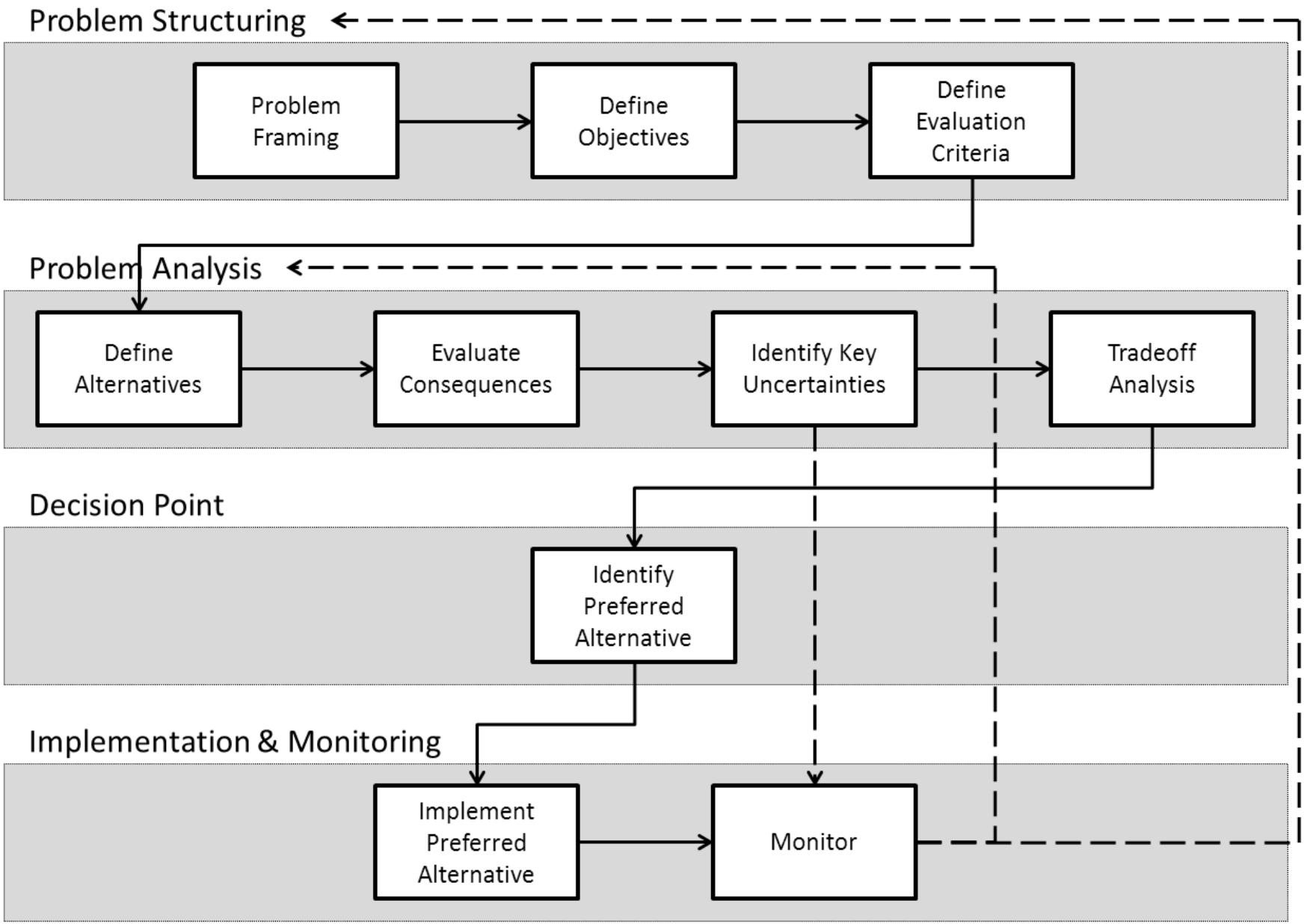
Planned deliverables

- 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