Integrated fuels management

Program overview and Synthesis

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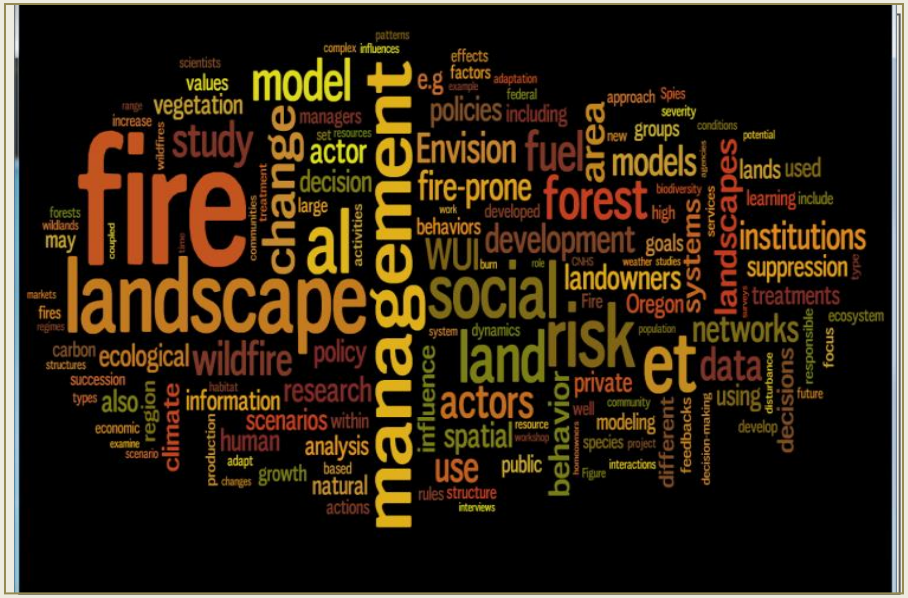
USDA Forest Service
PNW Research Station



Integrated fuels management

- Wildland Fire and Fuels Research and Development Strategic Plan. “Portfolio D. Integrated Fire and Fuels

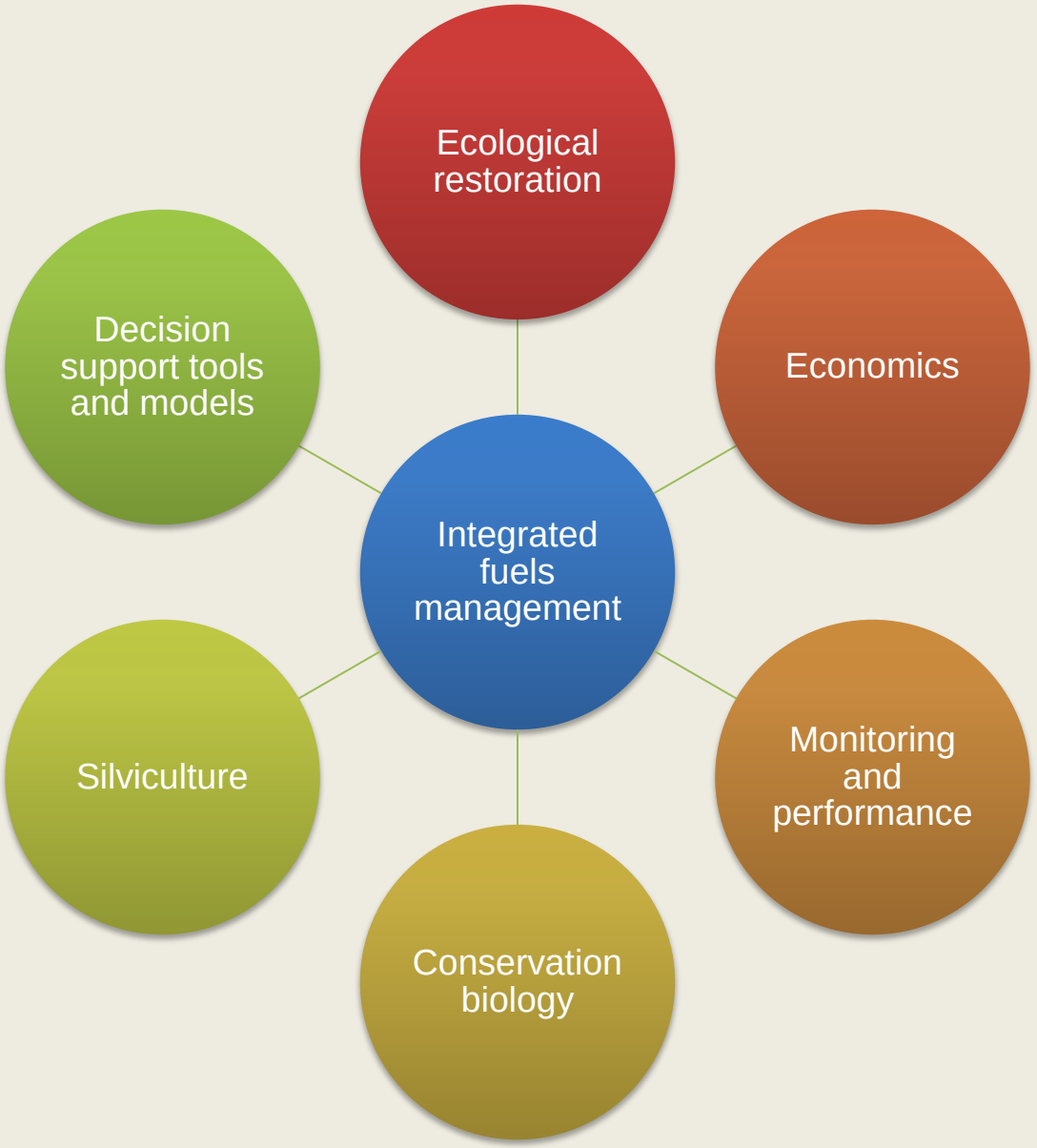
  “Providing a suite of approaches and techniques from which managers can select the most appropriate means for meeting their objectives requires integrated understanding and modeling, [of fire and fuels] at landscape, regional, national, and international scales”

Context for integrated fuel research

- Primary focus is supporting federal agency hazardous fuel management programs
  - Reducing hazardous fuels to restore ecological conditions and human values
  - $200 – $300 million annual expenditures
  - > 2,000,000 acres treated per year
  - Part of an integrated wildfire risk management strategy.

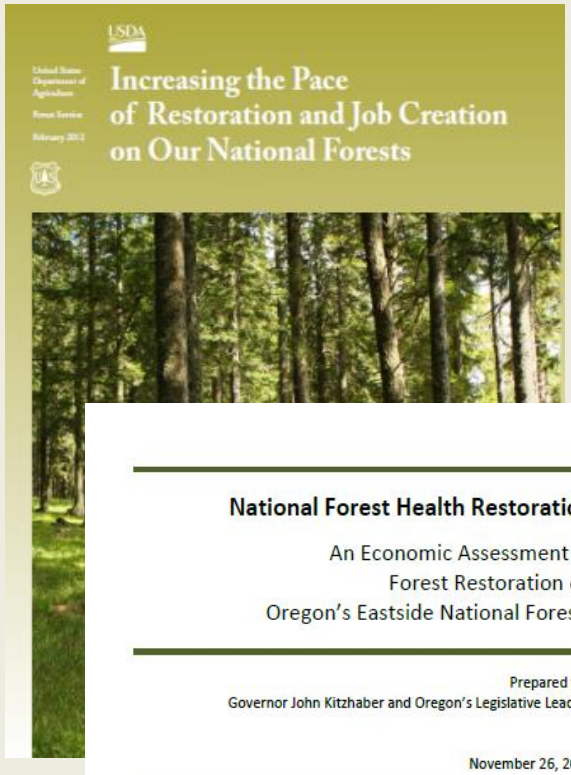


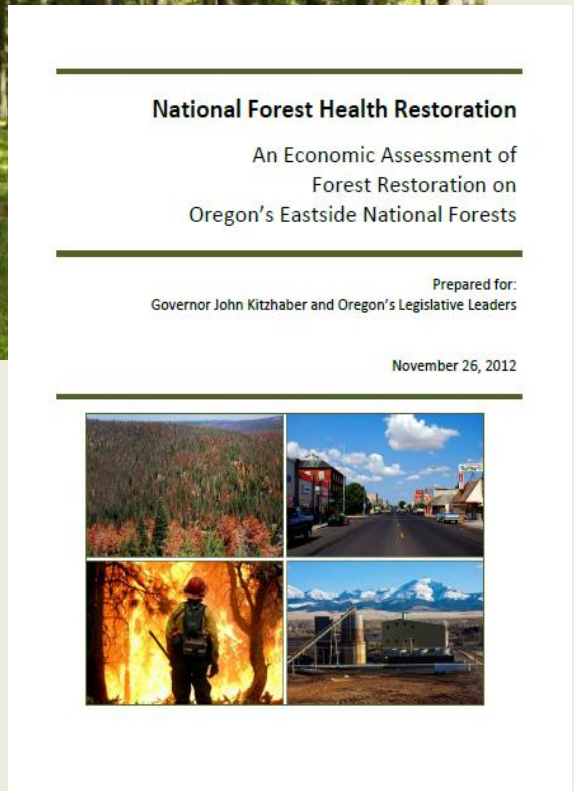
Integrated fuels management



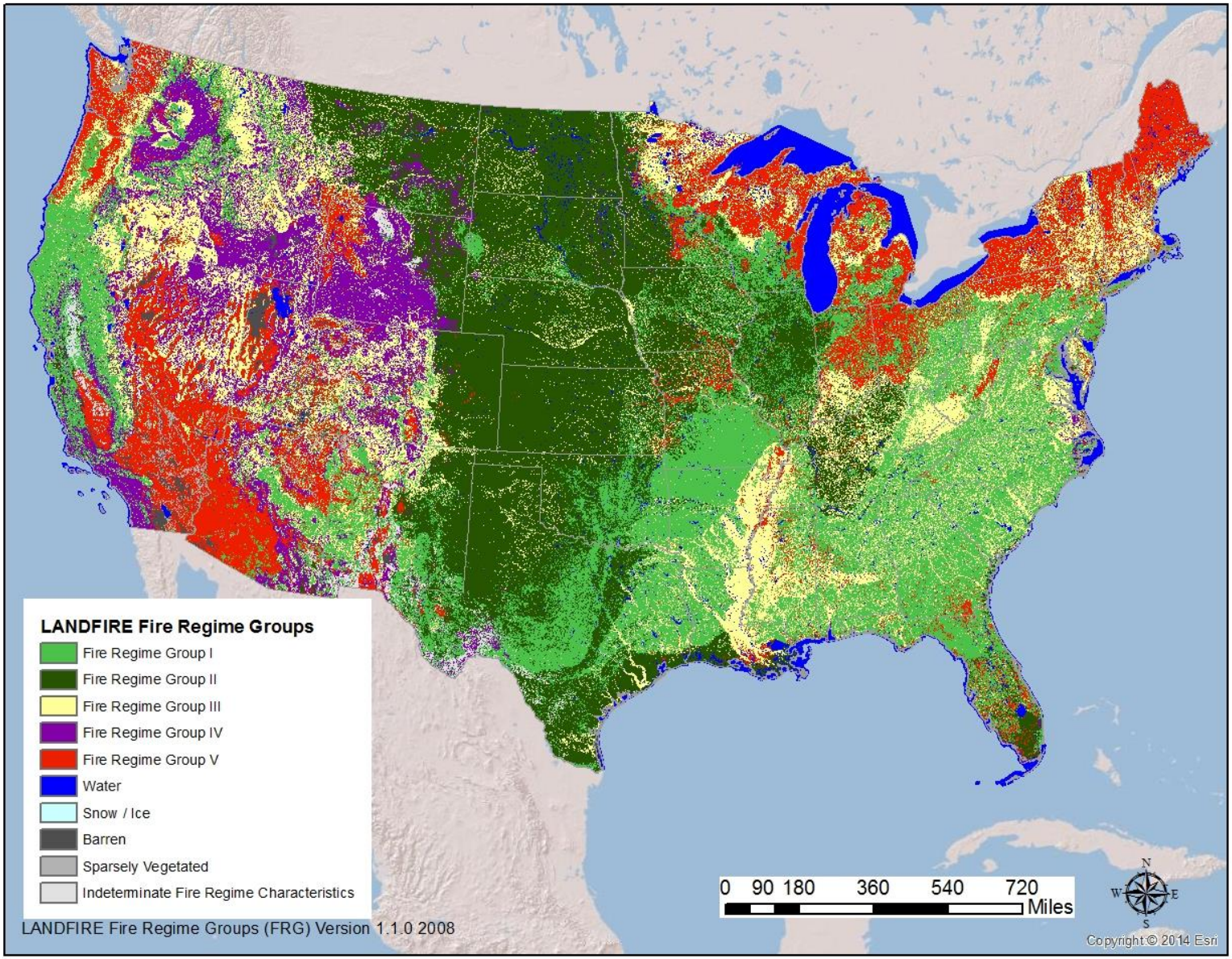
Fuels research is an integral part to USFS initiatives

- Accelerated restoration
- Forest plan revisions
- Collaborative planning
- FLAME Act and Cohesive Strategy
- (Federal Land Assistance, Management and Enhancement Act or FLAME Act)





Diversity of fire regimes


LANDFIRE Fire Regime Groups
Fire Regime Group I
Fire Regime Group II
Fire Regime Group III
Fire Regime Group IV
Fire Regime Group V
Water
Snow / Ice
Barren
Sparsely Vegetated
Indeterminate Fire Regime Characteristics
LANDFIRE Fire Regime Groups (FRG) Version 1.1.0 2008
0 90 180 360 540 720
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Diversity of ecological values

Fire adapted

Fire resilient

Fire intolerant

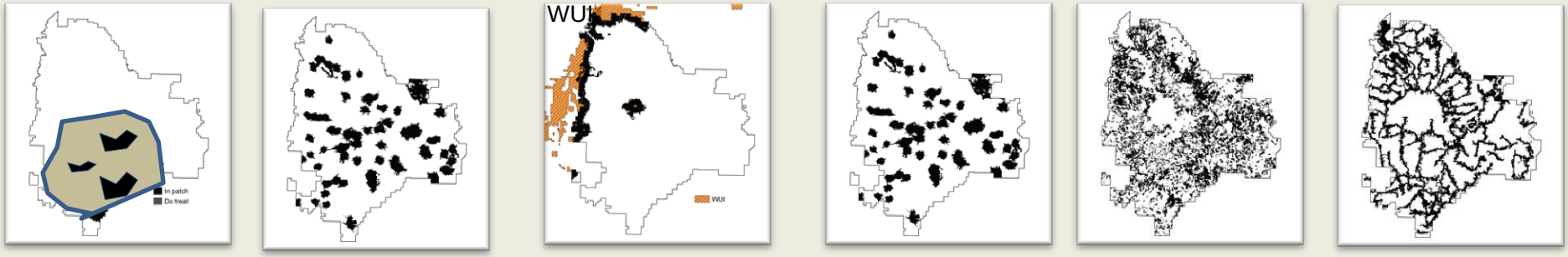
Diversity of fuel management objectives

Diversity of fuel management strategies

Fire resilient landscapes | Fire adapted communities | Wildfire response

Restoration | Protection | Containment

Low hazard fire containers	Strategic Restoration of natural fuel breaks	Focused defensible fuel breaks	Dispersed fuel breaks	Treatment optimization model	High hazard fire containers



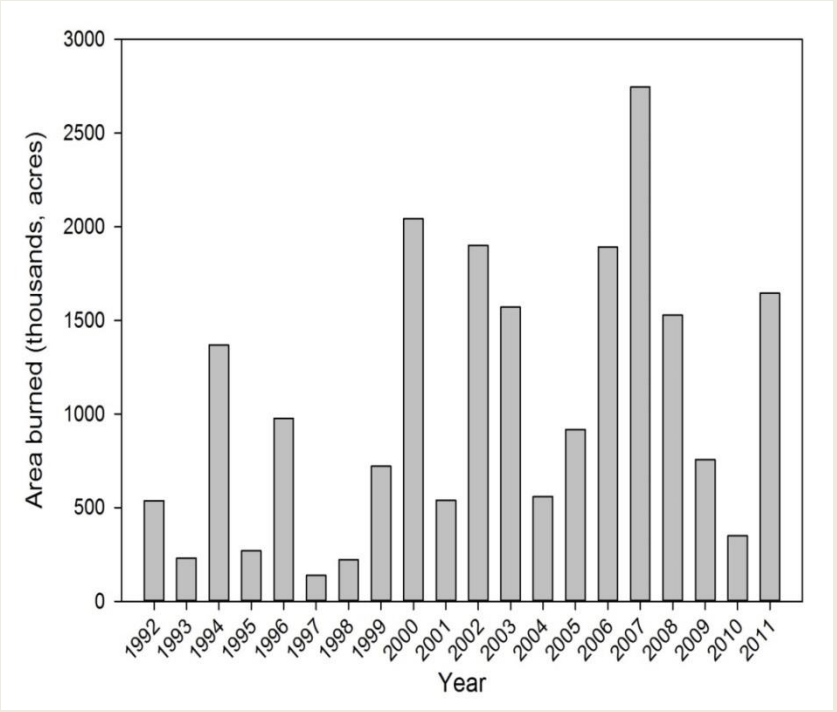
Landscape treatment strategies (Black polygons represent treatment units)

Fuel management research is conducted before, during, and after wildfires

	Preparing for fire - fuels management	**Responding to fire**	**Recovering from willdfires**
Approach and system	• Wildfire simulation modeling • Landscape planning • Field studies on ecological impacts and treatment effectiveness	Active fire behavior observations in treated areas	Assessment of wildfire intensity and spread patterns around known treatments

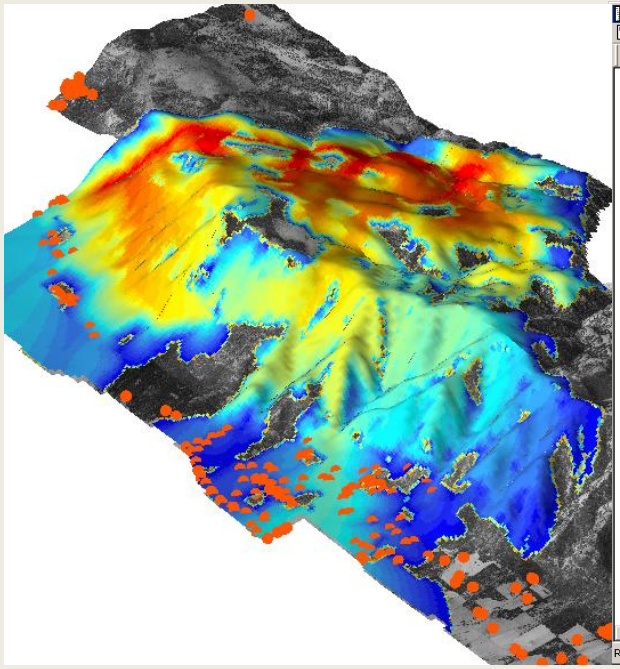
Key challenge for fuel management research

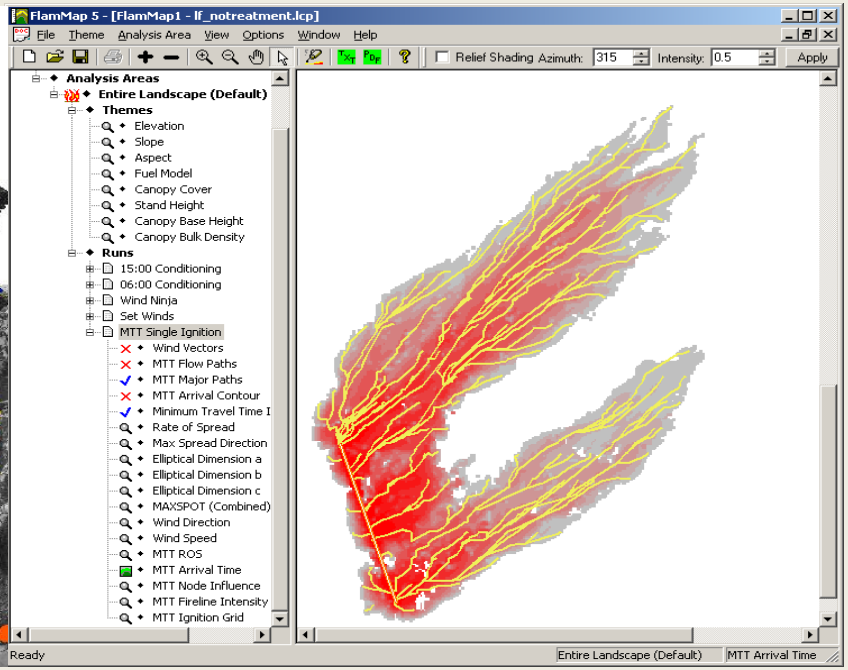
- Wildfire events are highly stochastic
- Difficult to test effectiveness of fuel management
- Difficult to prioritize investments within and among national forests
- Where is the risk?



Fire simulation models

- FlamMap
- Fsim
- FSPro
- Farsite





Consistent definition of risk

Wildfire risk = probability of a fire of a specific intensity x the loss at that intensity

"expected loss"

Let… $p(f_i) =$ Probability of burning at intensity level *i* — "Exposure"

$R(f_i) =$ Response for intensity *i* — "Susceptibility"

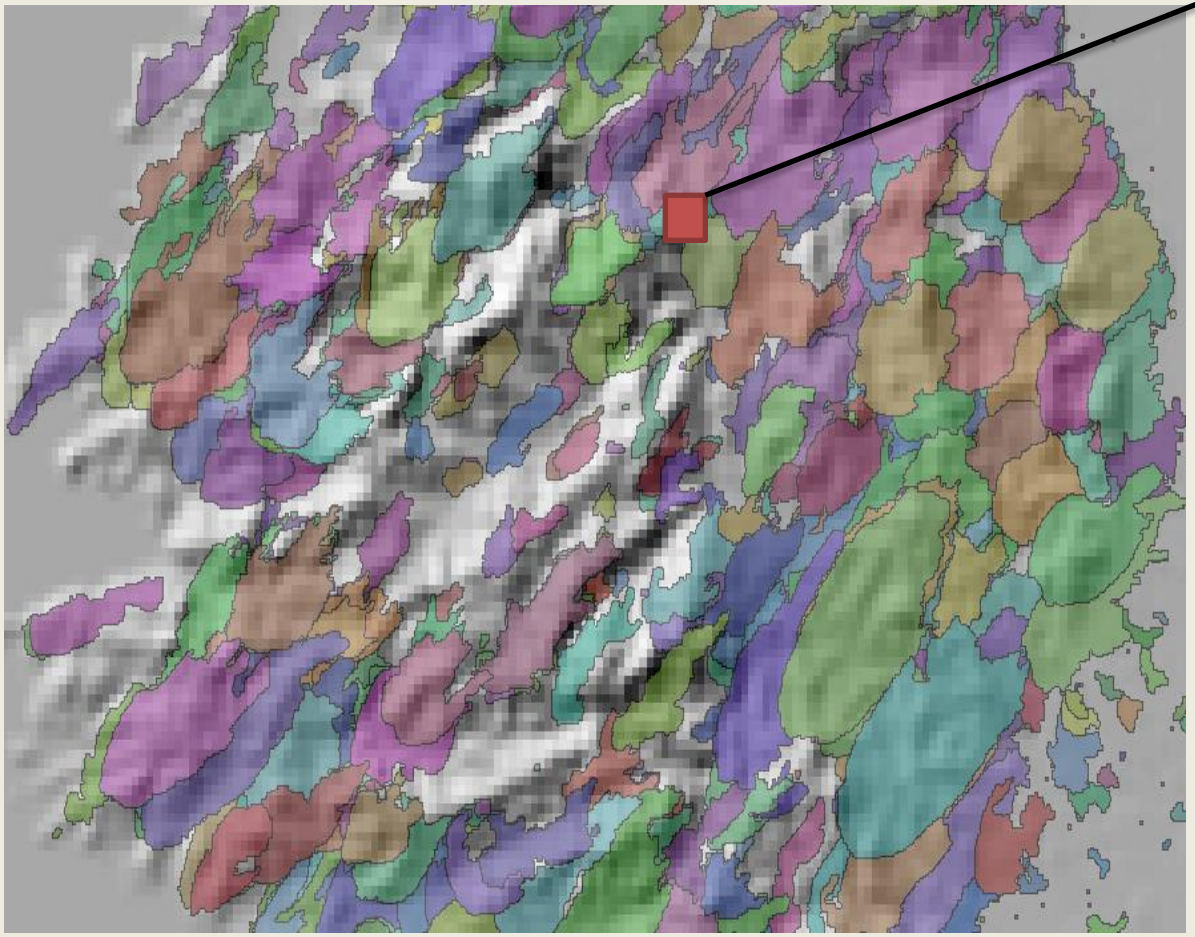
$E(L) =$ Expected loss — "Risk"

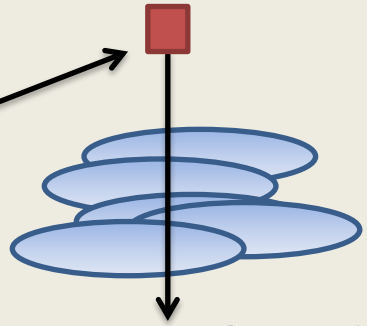
$$E(L) = \sum_i p(f_i) * R(f_i)$$

We sum over ***i*** because fire can arrive at many intensities at a particular location

Estimating burn probability

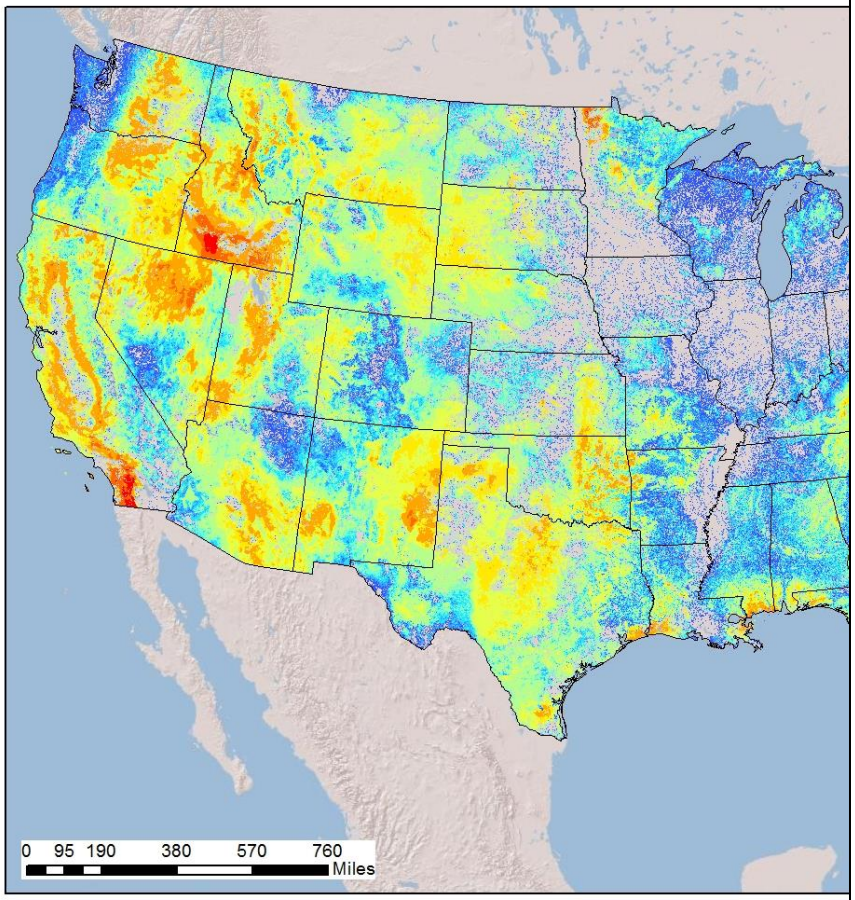
$$E(L) = \sum_i p(f_i) * R(f_i)$$





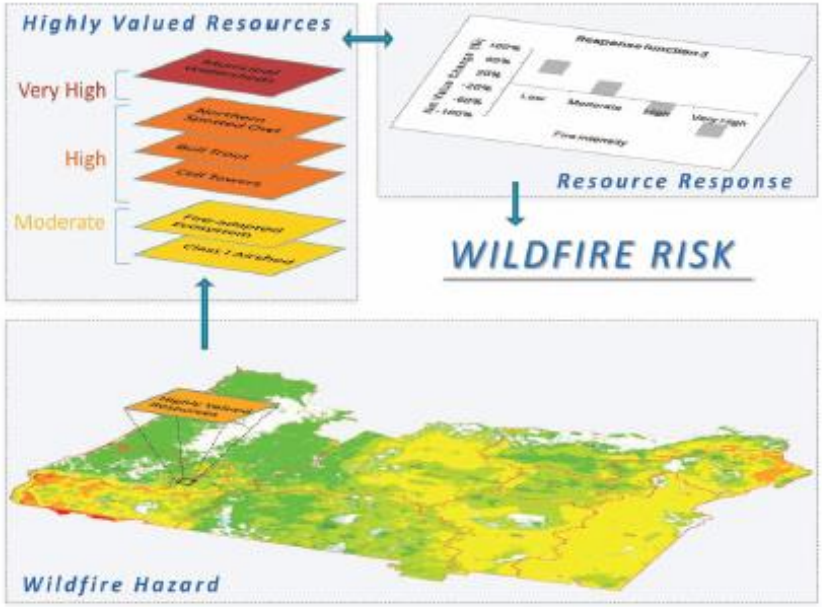
- BP = number of fires that hit the pixel/total fires simulated

Risk assessment for fuels planning

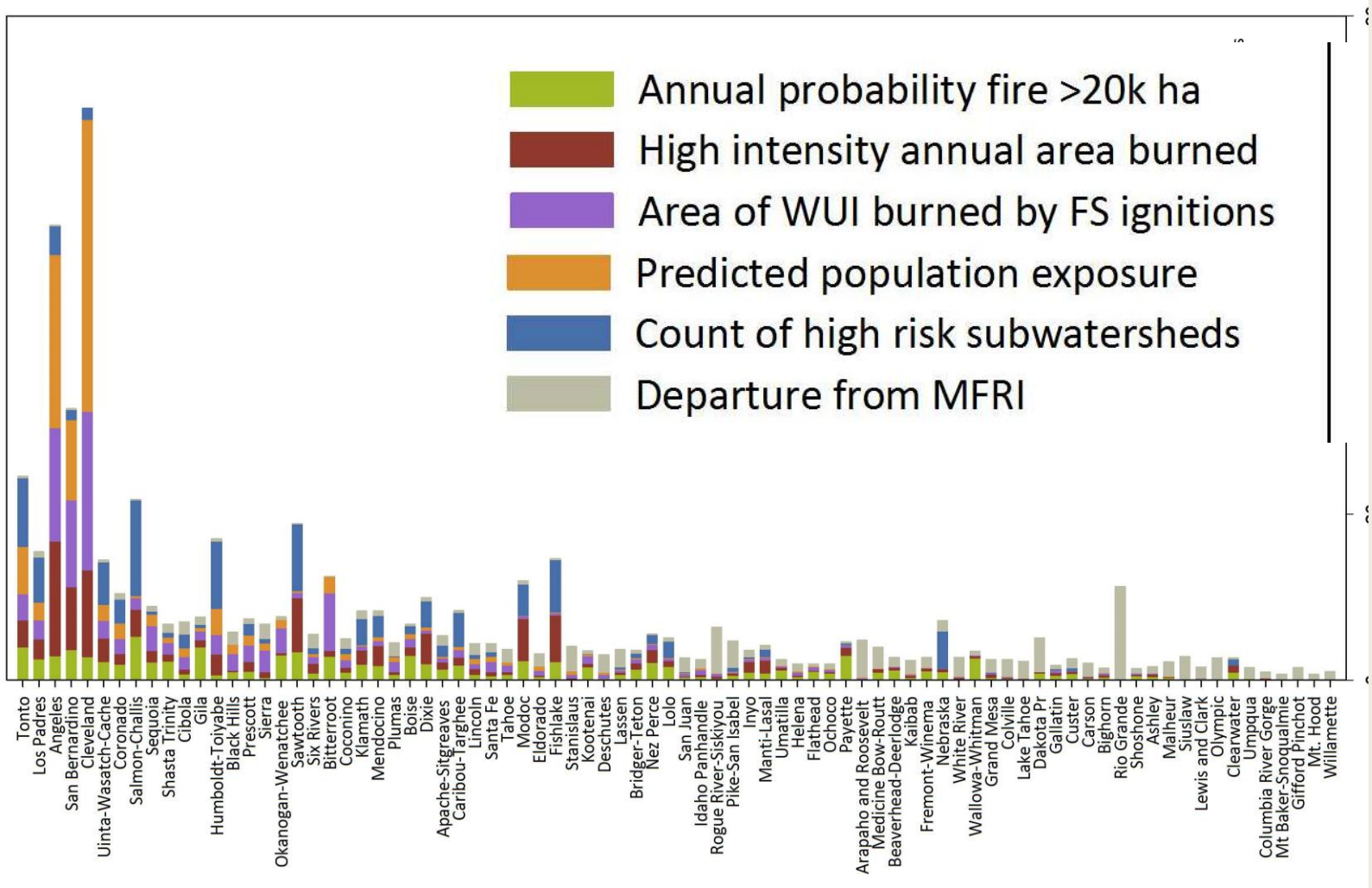


USDA United States Department of Agriculture
Forest Service
Rocky Mountain Research Station
General Technical Report RMRS-GTR-235
March 2010

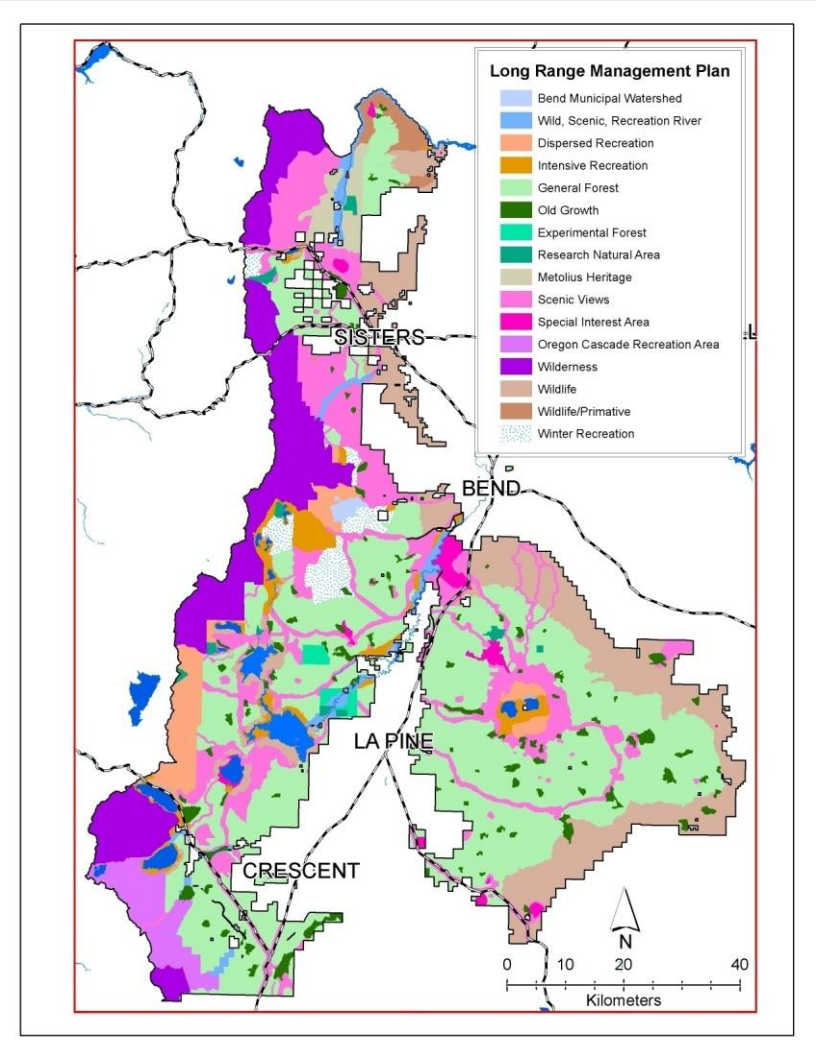
Wildfire Risk and Hazard: Procedures for the First Approximation



National Forest wildfire exposure assessments

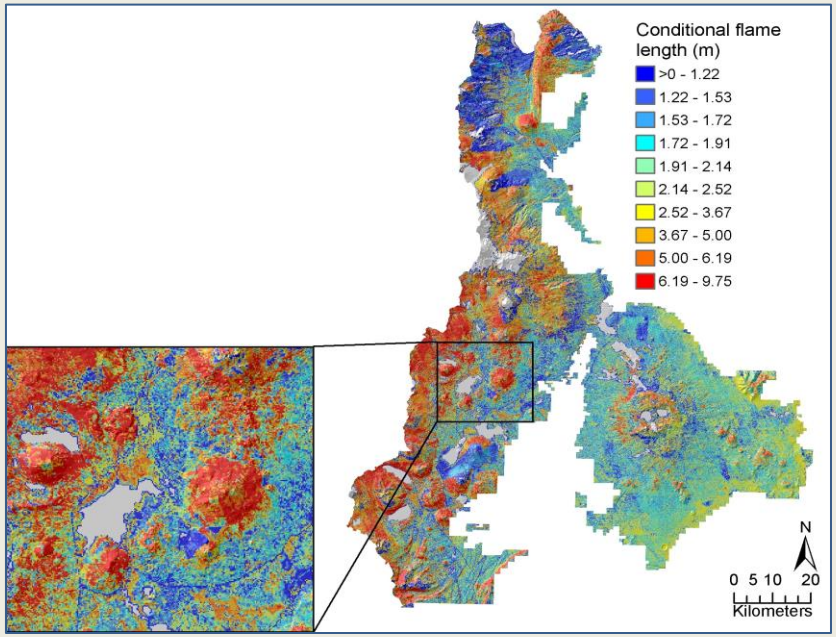


Risk assessments for individual national forests

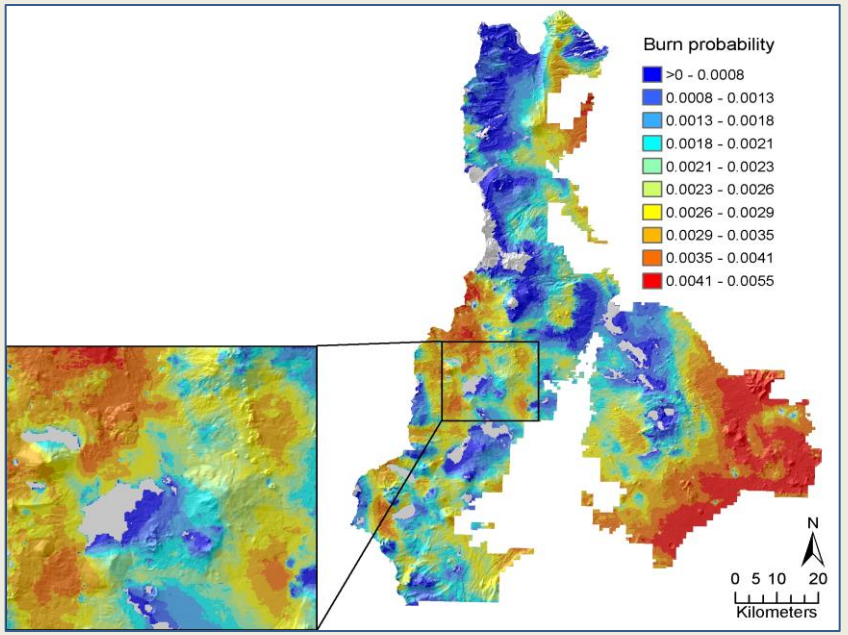


Simulation at the national forest scale

- Fine-scale maps of wildfire exposure generated from simulation models inform local managers on fuel management priorities



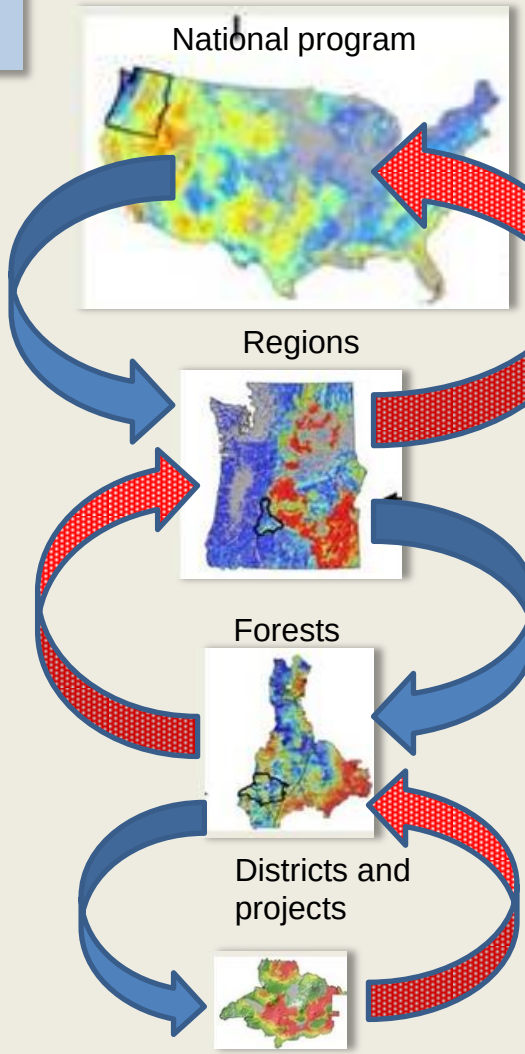
Flame length



Burn probability

Risk–based strategic fuels planning

Risk based allocation and prioritization

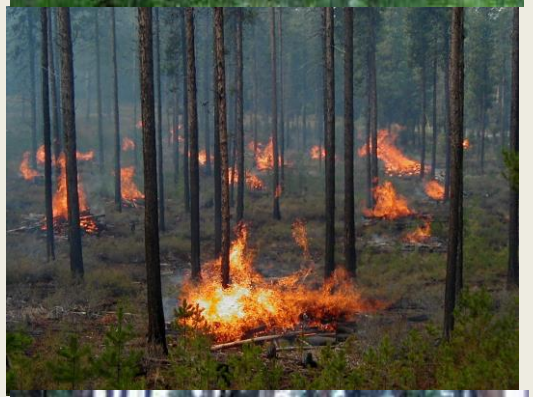


Risk based decision support tools and framework

Risk based monitoring, adjustment and learning

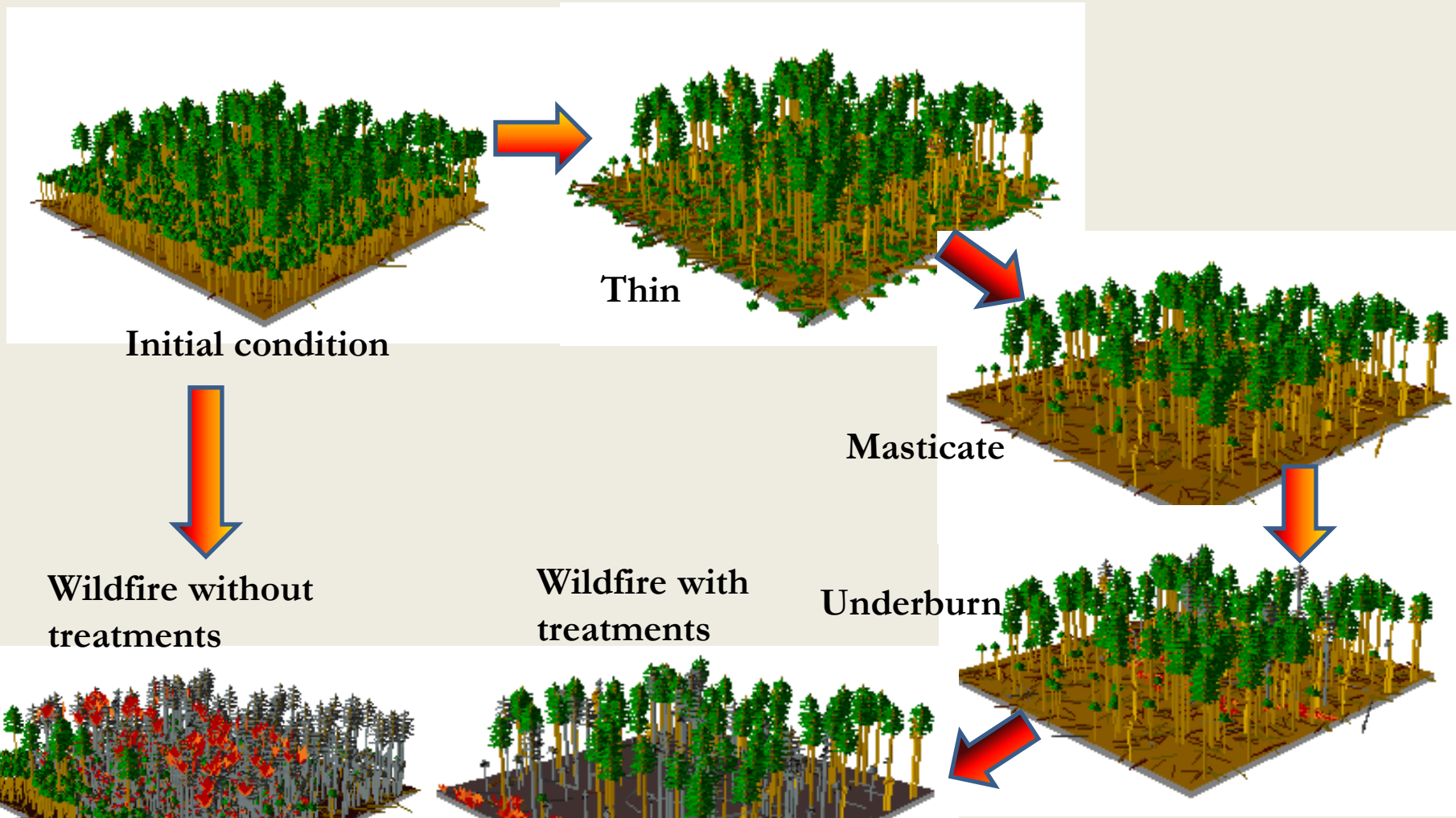
Fuel treatments: science and implementation

- Thinning
- Prescribed fire
- Managed fire
- Piling
- Jackpot burning
- Mastication

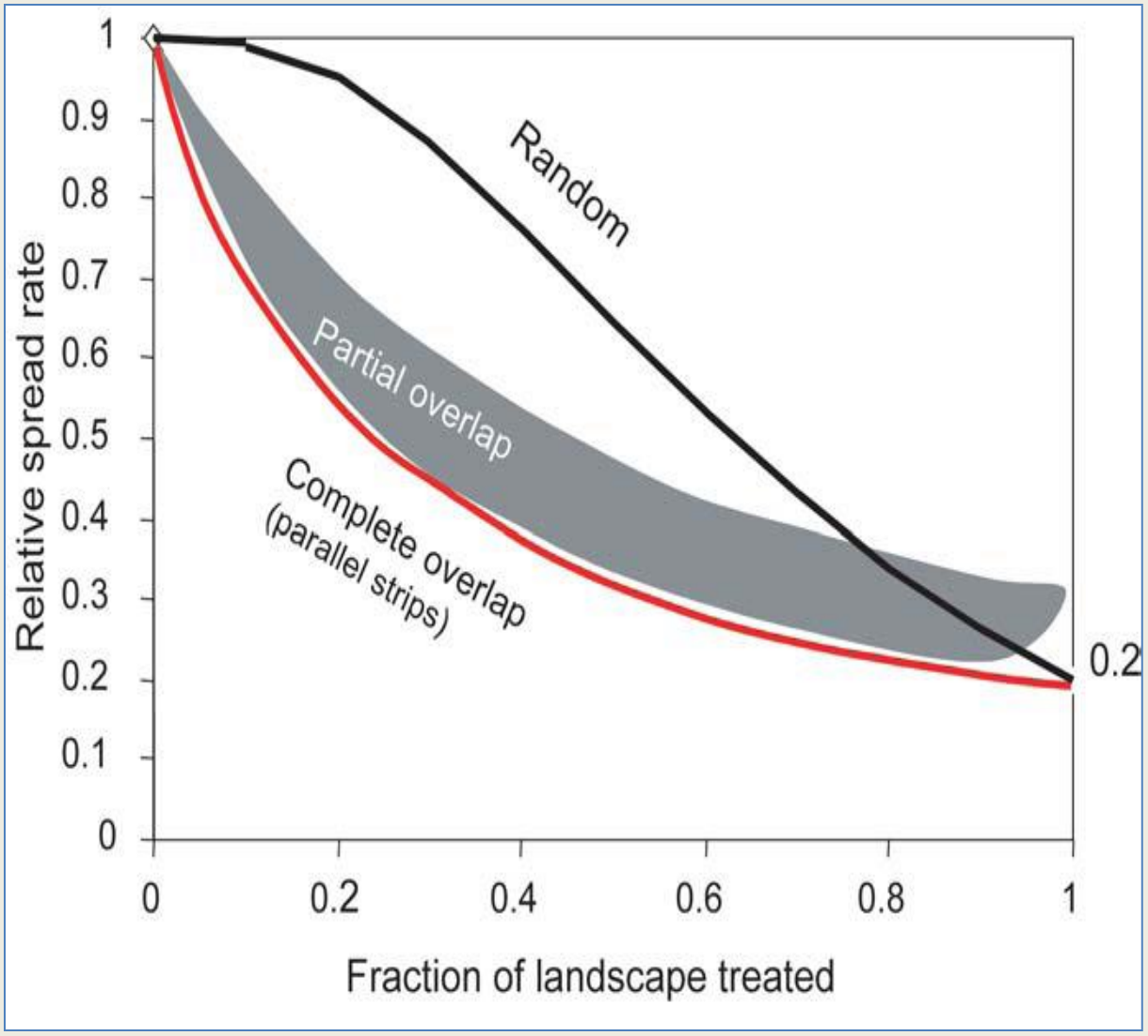


What stand treatments are needed to make a difference?

Modeling stand silviculture for fuels management

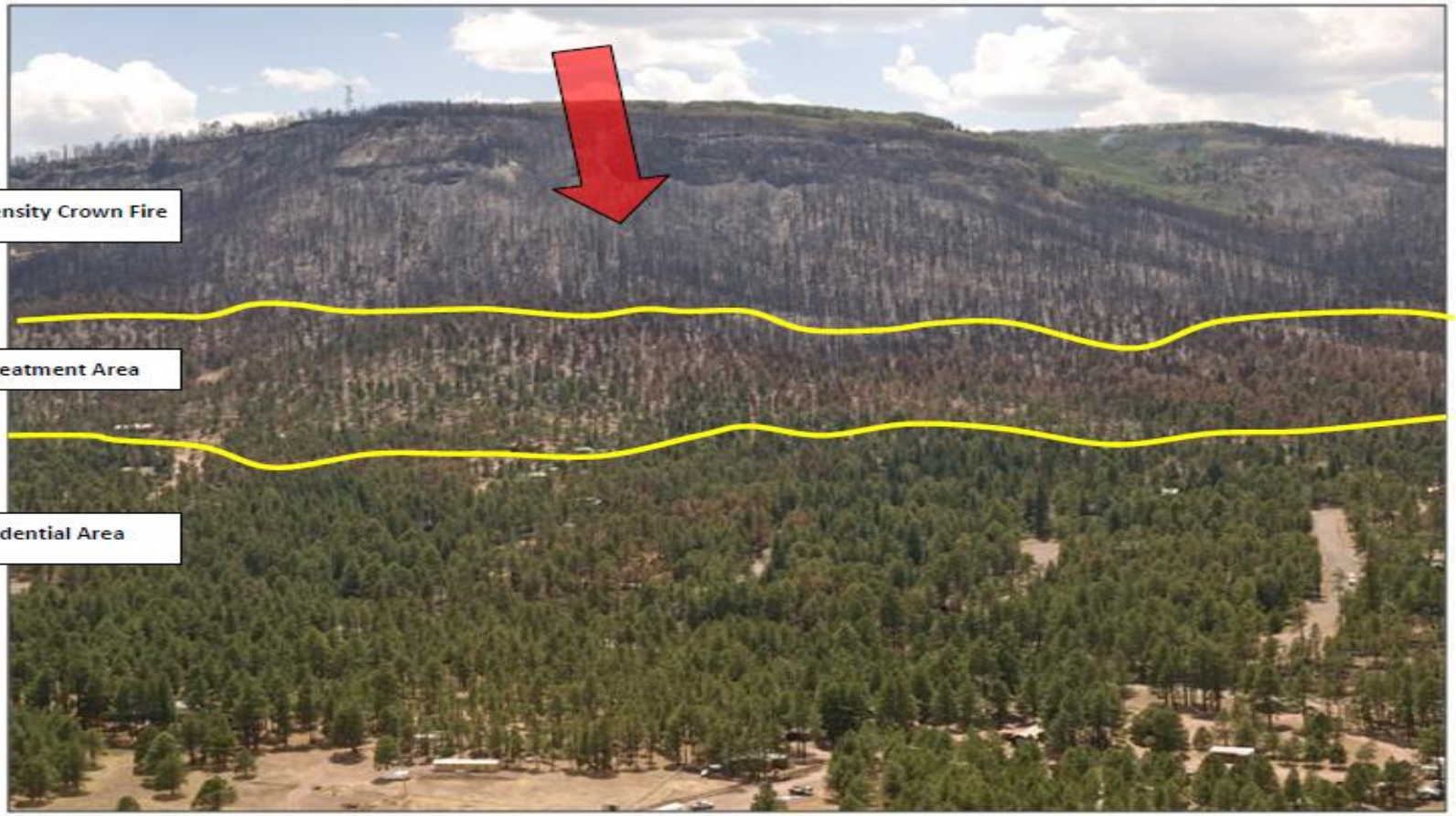


Effect of treatment area and treatment type on spread rate



Successes from fuel management

How Fuel Treatments Saved Homes from the Wallow Fire



Homes Saved

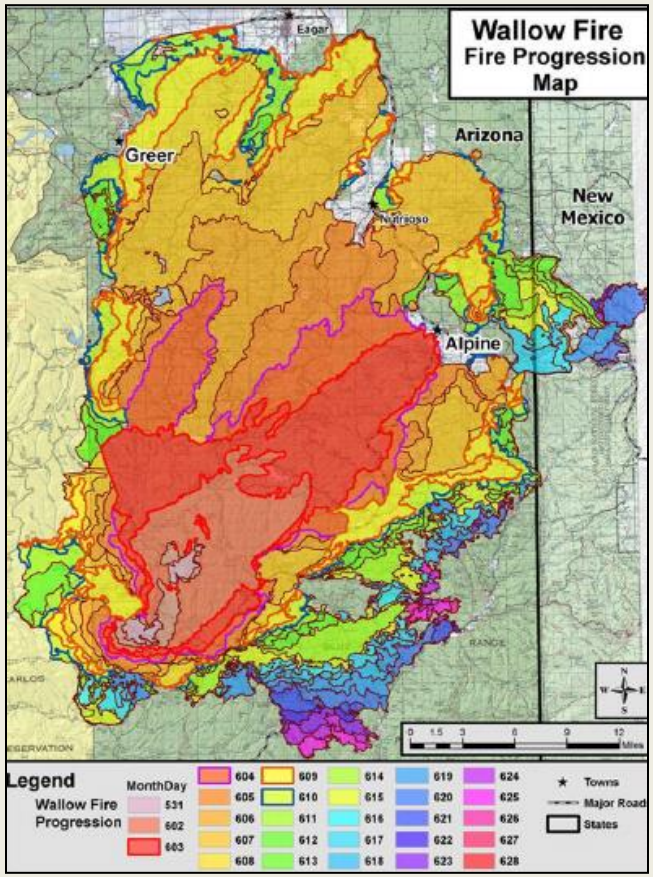
Red arrow indicates the direction of the crown fire's spread toward the Alpine community's homes. Yellow lines delineate the approximate location of the Alpine Wildland-Urban Interface Unit 2 Fuel Treatment Area. As the fire raced downslope, numerous Alpine houses were at risk from the crown fire. (While only a few of the house roofs can be seen in this photo, approximately 40 homes are located in this area—and a total of 100 homes were threatened in south Alpine.) Just as was illustrated in the photo on the previous page, this photo also shows how the fuel treatment area slowed and diminished the Wallow Fire's intensity, helping to save these homes.

Failures

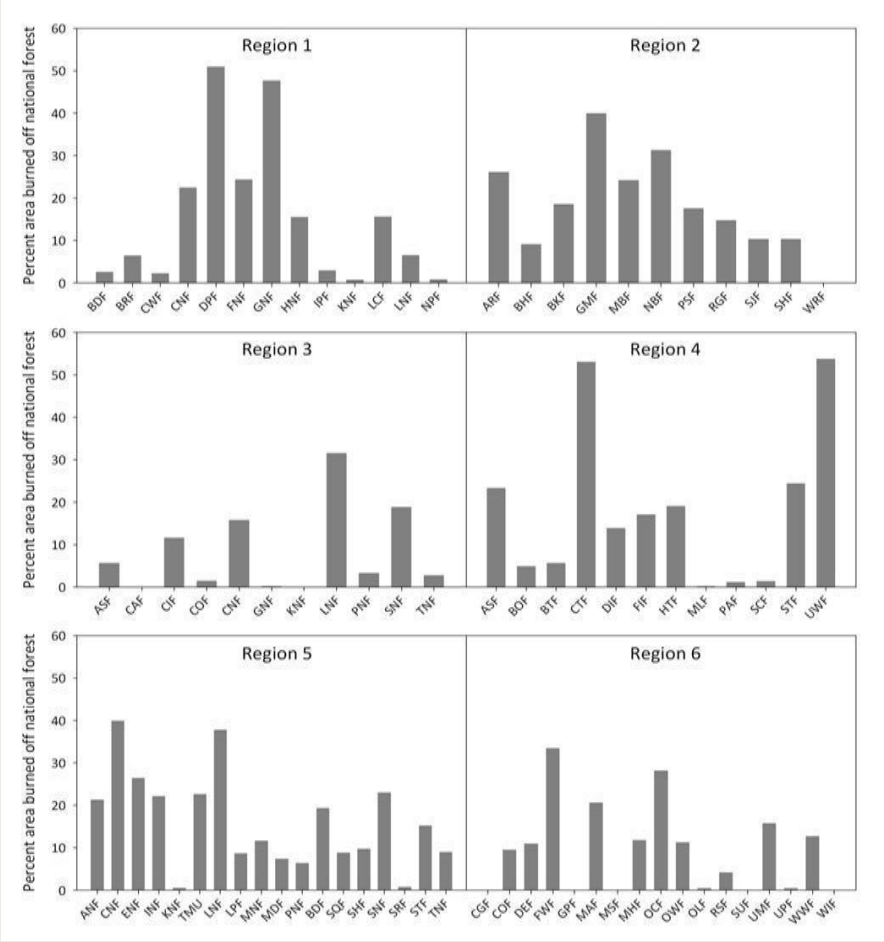

Four Mile Fire, Colorado
Sept 6 2012
Extensive fuel treatments
162 homes burned first day

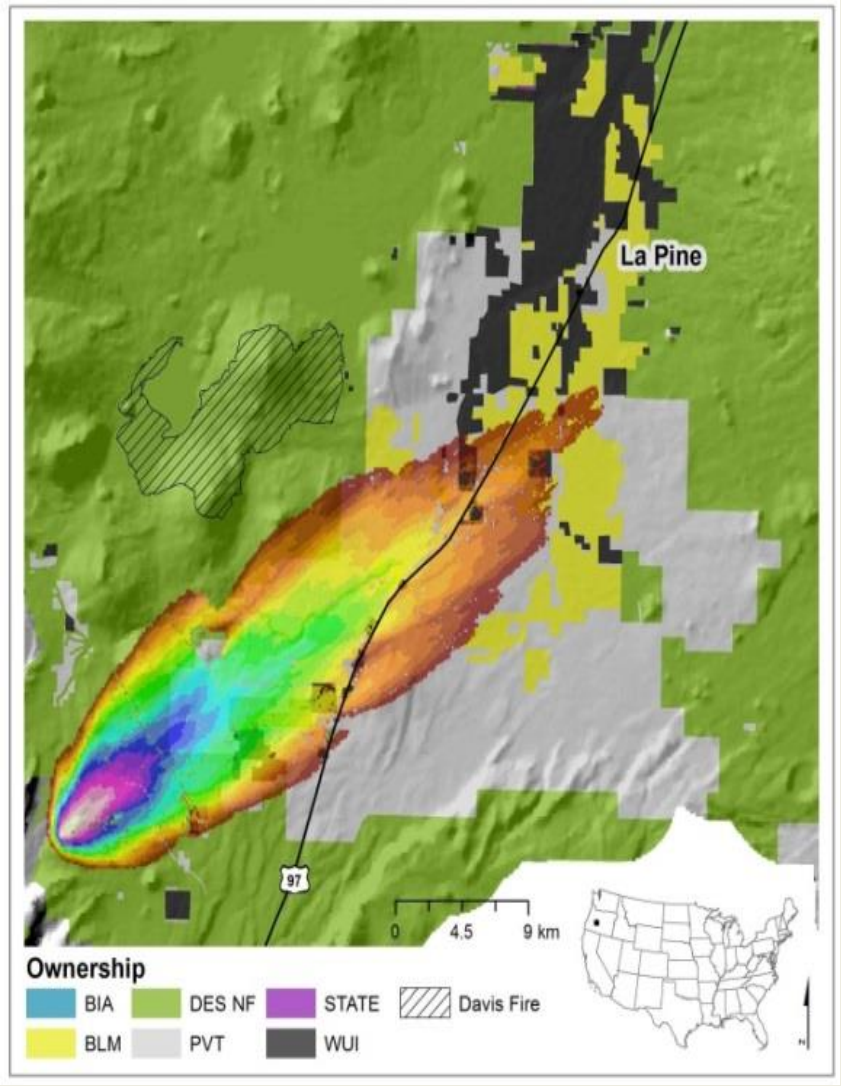
Wildfire risk transmission

- Who owns the risk?



Wildfire risk transmission



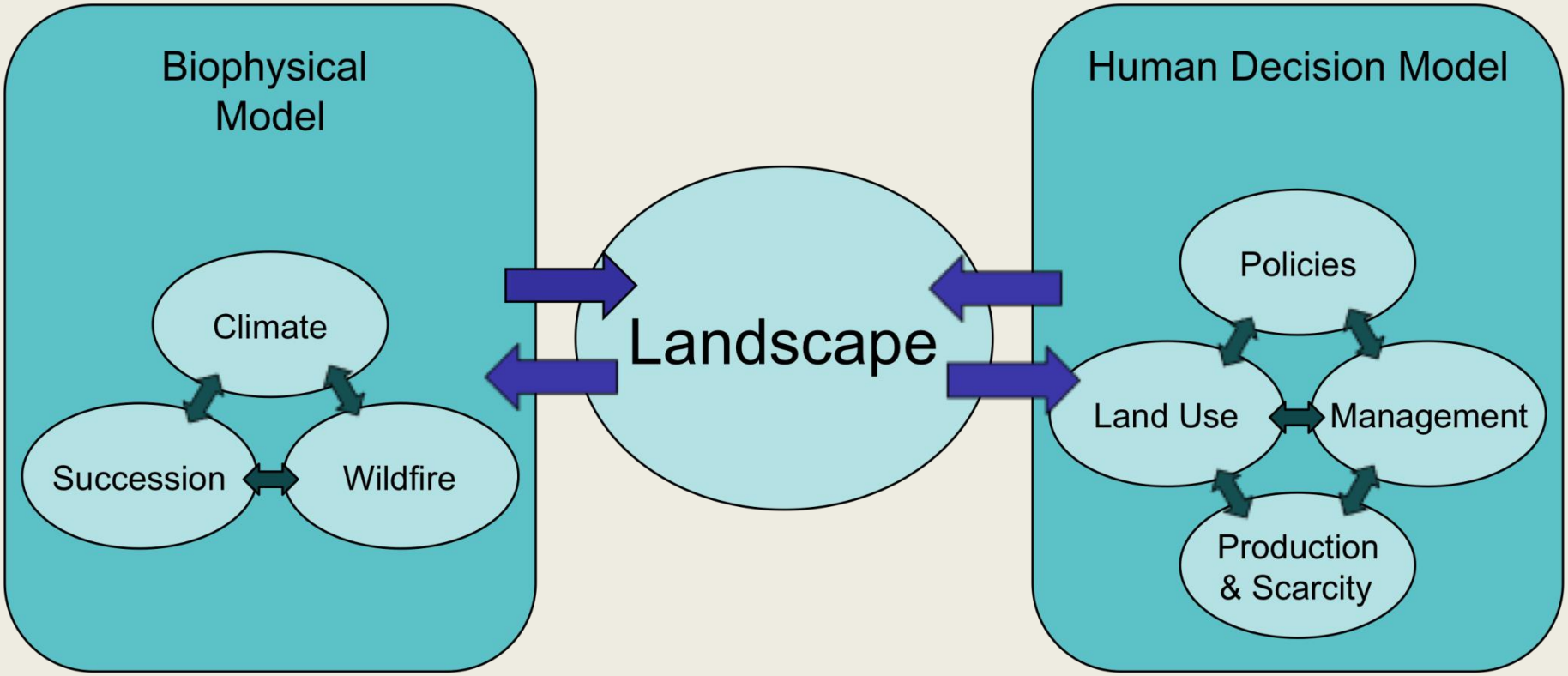


Grand challenges

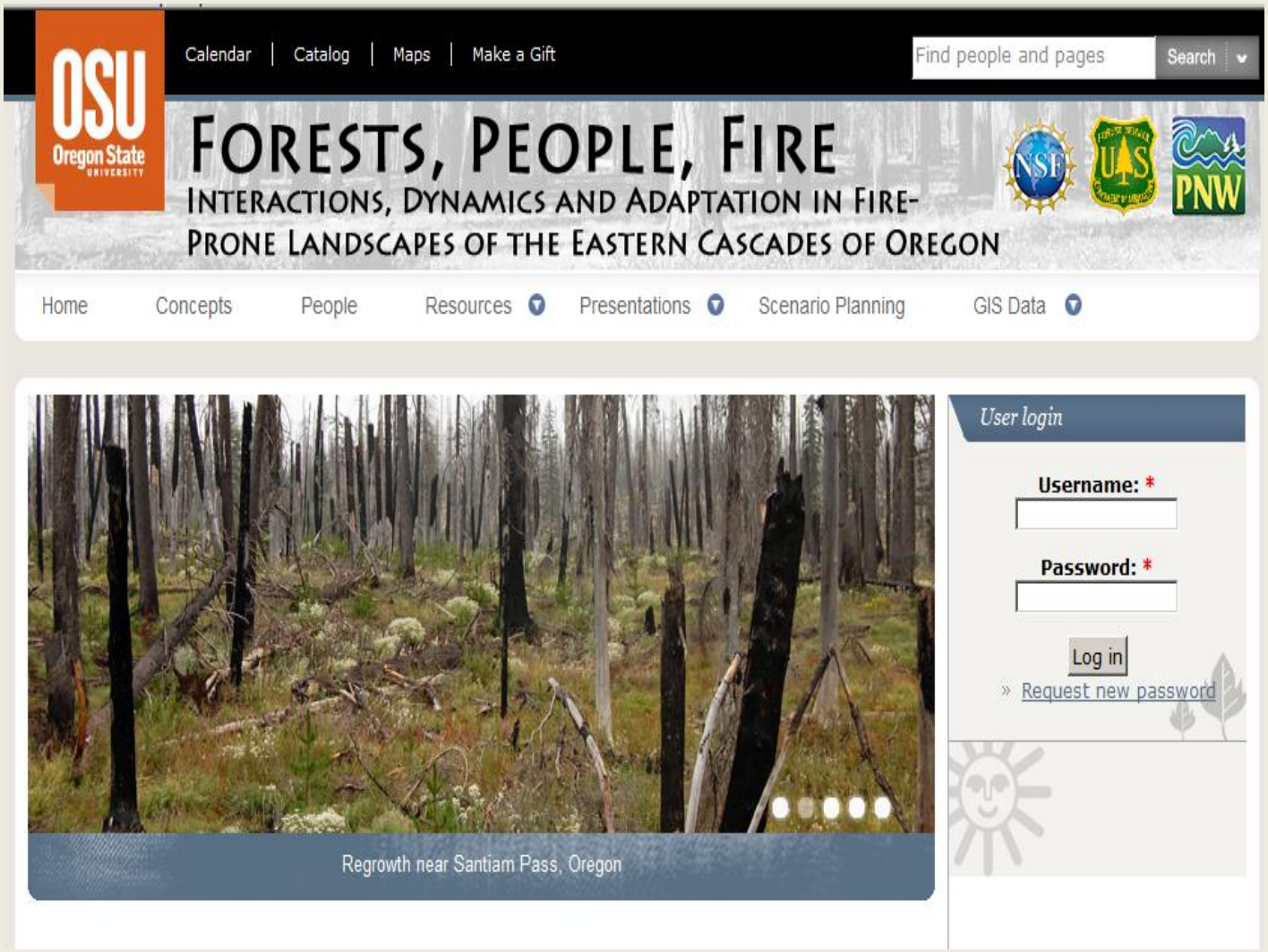
1. Are we making a difference?
2. Tipping point?
3. Invest in suppression or fuel management?
4. Private sector sharing the risk
5. Scale mismatches in fuel planning

CHANS Approach

Coupling human and natural systems to manage wildfire risk dynamics



CHANS Modeling



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Agent-based modeling of landscape change: Envision

Actors

Decision-makers managing the landscape by selecting policies responsive to their objectives

Landscape Feedbacks

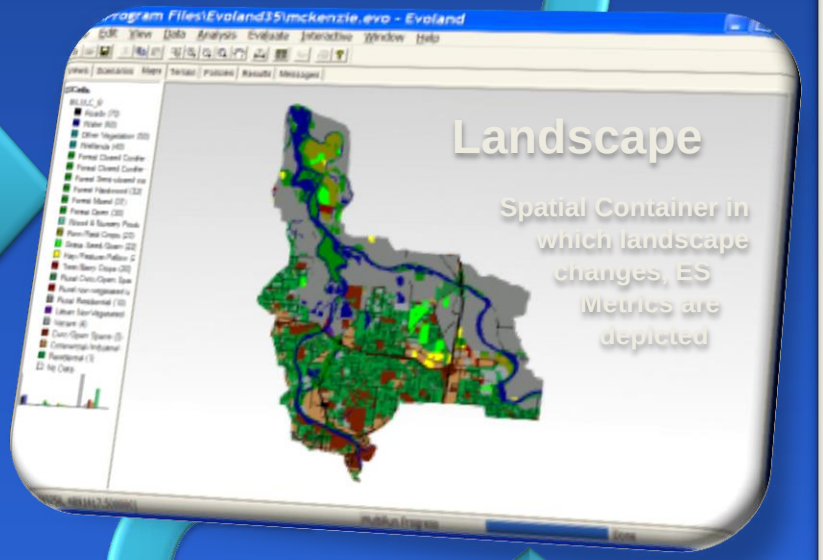
Landscape Production Models

Generate Landscape Metrics Reflecting Ecosystem Service & Economic Productions

Scenario Definition

Multi-agent Decision-making

Select policies and generate land management decision affecting landscape



Policies

Fundamental Descriptors of constraints and actions defining land use management decision making

Autonomous Change Processes

Models of Non-anthropogenic Landscape Change

Slide Courtesy John Bolte

Questions?