

# Forests, People, Fire: A Coupled Human and Natural

System in a Fire-Prone Landscape

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# A region of conflict and large assessments

Distribution of Major Environmental Assessments in the Pacific Northwest 1972-2010

Policy makers want and need better tools and approaches to support decisions about natural resources within complex systems

Researchers need to better understand how coupled human natural systems work to provide a scientific framework for sustainability science

# Moving assessments toward more fully developed social-ecological thinking

- Feedbacks and nonlinear interactions
- External drivers, e.g.
  - Markets
  - Climate change
  - Invasive spp.
- Public participation
- Scenario analysis



#### Framework for Analysis of Social-Ecological Systems



Based on Ostrom 2009



Based on Ostrom 2009

#### Forest Ecosystem Management Assessment 1993 Northwest Forest Plan



#### Role for Scenario Analysis



Zurek and Henrichs 2007



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### FPF Study Area





Wildfire History on Deschutes NF 1900- 2008

# How have humans changed this landscape?

- Logging
- Roads
- Fire Suppression
- Development
- Invasive species
- Recreation sites and activities



#### Historical dynamics of fire and succession in Ponderosa Pine



60 yrs





Fire Suppression



R. Van Pelt

Northern Spotted Owl, Mule Deer, and White-Headed Woodpeckers Use Different Older Forest Structures



Courtesy of Norm Johnson



### Area burned – Western U.S., 1916 - 2007



Courtesy of David Peterson

### **Population Change**









# WUI: Small in Area Large in Effect





WUI protection is the major driver of FS suppression costs, with some staff estimating that between 50 to 95 percent of large wildfire suppression expenditures were directly related to protecting private property and homes in the WUI.... USDA Audit Report



# Mill capacity and employment have declined:

•Modernization,

Market forces

•Decline in supply of woody material from federal forests

Timber Industry now seen by many as vital to meeting ecological goals in dry, fire-prone forests



# **Major Questions**

- How do policies, social networks and institutions, and actor decisions influence landscape dynamics and produce intended and unintended consequences for biodiversity and ecosystem services ?
- How sensitive are landscape outcomes to feedbacks from social networks, socioeconomic institutions, landscape patterns, and alternative policies?
- How might external drivers such as climate change and market forces alter landscape dynamics and the production of ecosystem goods and services?



#### **Forests-People-Fire Assessment Modeling Framework**



Major landowner actor groups who manipulate forest vegetation and fire

Actor	Goals	Actions	Influencing Factors
Public Forest Managers	Reduce Fire Hazard Ecosystem Services	Manipulate vegetation/Fuels Suppress wildfire Harvest timber	Costs Risk perception Policies/laws Public acceptance
Tribes	Financial return Reduce fire Hazard	Same as above	Same as above
Large Company	Financial Return Reduce fire Hazard Other values	Same as above + Develop land	Same as above + Prices Land values
Non-industrial	Amenities Reduce Fire Hazard Financial return	Same as above + Develop land Firewise	Same as above + Values Social networks
Home-owners	Amenities Reduce Fire Hazard	Firewise Sell home	Costs Risk perception Values Social networks

### Landscape evaluators and feedbacks



A challenge in many fire-prone Landscapes:

# How do Agents Perceive Risk, Benefits, Feedbacks from their actions (or inactions)?

- Few agents directly experience loss from a wildfire
- Few agents directly experience benefit from reducing fire hazard



## **Agent-Based Concept**:

# How do agents learn about consequences of their actions in environment?



# Institutional Fire and Forest Network in Central and Southern Oregon



Paige Fischer, Draft

# Surveys and Interviews with Agents Questions Related to:

- Vegetation decisions and actions
- Attitudes about risk, fire and forest management
- Experience with wildfire

- Landscape and economic influences on decisions
- Influence of social networks on decisions
- Social network structure



#### **Homeowners and Firewise activity**

**Survey question:** Within the last five years, have you completed any "firewise" activities in the immediate vicinity of the residence? **Logit analysis:** Pr(yes) = f(x)

#### Example hypothesized explanatory variables (x):

<u>Homeowner characteristics</u>: Network participation, past exposure to wildfire, tenure, home value, income

Landscape characteristics: Fuel loads and management activities on neighboring lands, proximity to past fire

# Scenario Development Workshops with Stakeholders Bend Klamath Falls



# **Examples of Possible Scenarios**

Scenario Theme	Characteristics	
Status Quo	Current policies Limited biomass Current fire frequency Current population trend Current budgets and level of forest management	
"Resilient" Forest	Integrated landscape policy More fuel treatment More landscape restoration Biomass utilization	
Climate Change with Status Quo	More fire Current levels of adaptation	
Climate Change with "Resilient" Forest	More fire Increased levels of adaptation	
Socio-economic diversification	New cultures and businesses More emphasis on amenities Less tolerant of smoke	

