

Economics of Fire Science

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 **NRCS** Natural Resources
Conservation Service

Economic Science

- Economics is not simply cost-benefit analysis of commercial values such as timber or property.
- Economics evaluates incentives for individuals' and managers' choices affecting risks or outcomes; market and non-market values affecting quality of life and tradeoffs among goods and services of value (tourism, water/air quality, wildlife).
- Economics provides a broad framework from which to evaluate alternatives for the public good.

Fire: Physical, Natural, Social

- U.S. Fire crises derive from historic policy, and community and individual choices that have raised fire risk and consequences.



- Historic fire suppression choices failed to recognize:
 - the ecological role of fire,
 - the incentives that suppression creates for individuals and communities to develop rural areas,
 - and the opportunities and benefits that ecosystems provide, or could have provided, under alternative management regimes.

Social and Economic Science

- Effective solutions will involve understanding:
 - public values sought from fire-prone ecosystems;
 - ecological and physical science basis to create, restore, sustain resources of public value;
 - incentives for individual (landowner, homeowner), business, and community actions relative to fire risk and consequences.

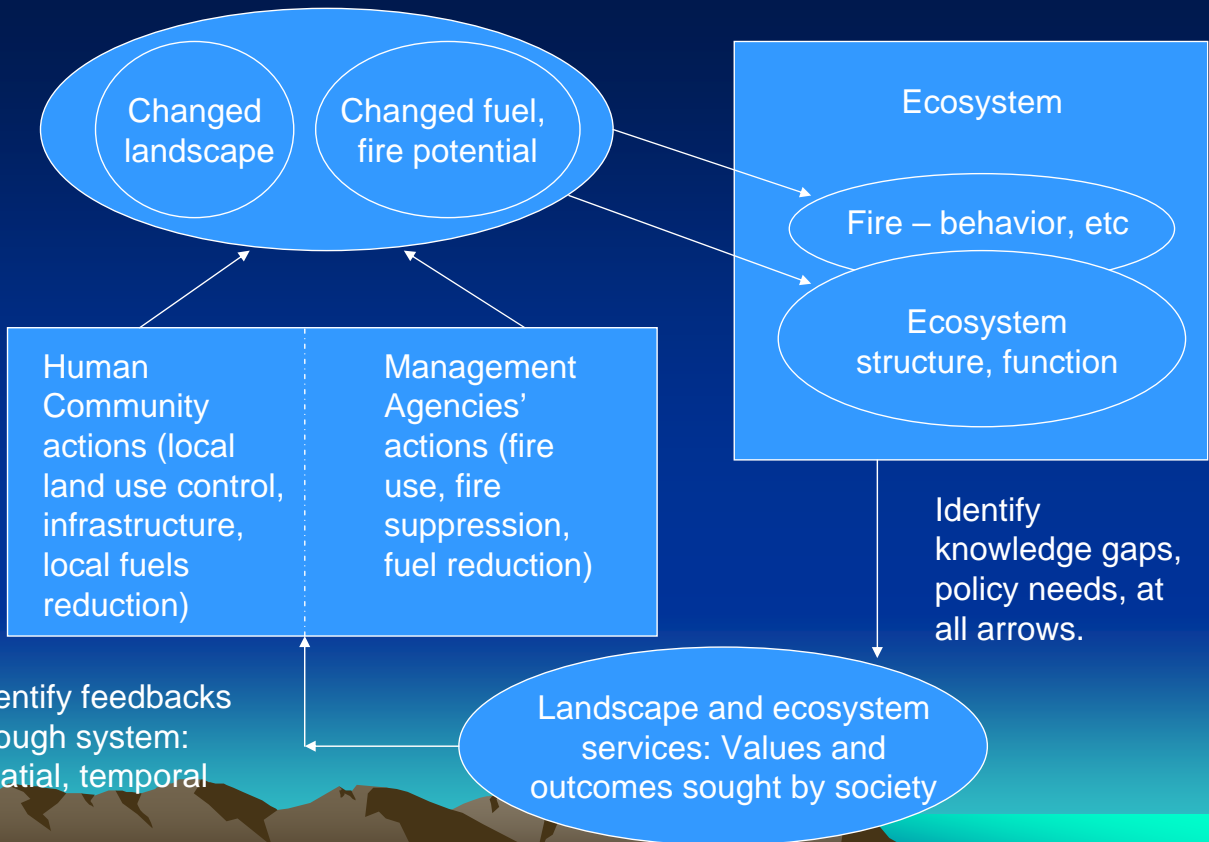
Public values

- Commercial value of timber and other natural resources
- Recreation sites: tourism and rural living
- Watersheds for water supply and quality
- Air quality (timing and intensity)
- Fire will happen:
The issues are when (natural, accidental or planned), how intense, and what will publicly-valued options be after fires.

Integrated Perspective

- Choose policy, management and research priorities, before and after fire, within a framework that creates and integrates ecological, physical and social science knowledge.
- Economic frameworks address how fire-adapted and fire-sensitive ecosystems produce valuable services, in space and time.
- Human choices within fire policy and management regimes create unanticipated or unintended consequences

Integrated Fire Research and Policy For Society – A comprehensive economic framework will integrate scientific disciplines to focus on public values.



Note: Inspired by collaboration with NSF LTER Planning Grant – LTER Decadal Plan

Pre-Fire Fuel Treatment

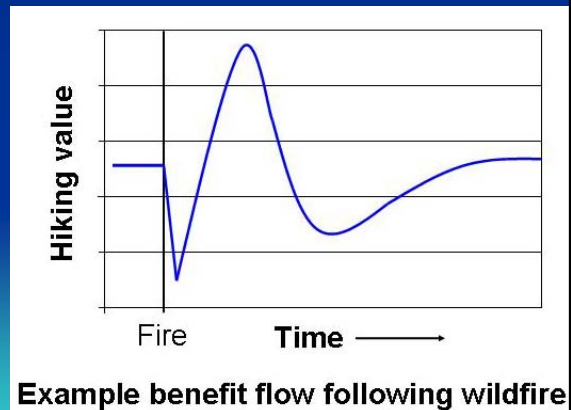
- Risks are distributed across vast landscapes, with substantial uncertainty limiting forecasts of ignition sites.
- Human causes can be linked to accessibility and economic well-being.
- Spatial, geographic linkages influence effectiveness of pre-fire treatment to reduce fuel accumulations.
- New knowledge and decision support models can increase benefits from (returns to) costly fuels reduction.
 - Cost effectiveness increases when guidelines stimulate actions relative to resource and community values that are enhanced.
 - For example, performance measures linked to “acres treated” create incentives to treat accessible acres rather than acres in locations that protect high-value watersheds, at-risk developments or sites of natural resource-based tourism.

Cost Benefit – Fuel Management

- Catastrophic fires can generate large losses of property and ecosystem values.
 - But dispersed risk (low ignition-risk in any particular location) implies expected value of fuel management is low at many locations.
 - Certainty of costs, uncertainty of benefits implies a need for decision support tools.
- Fire will occur.
 - What actions sustain desirable resource conditions at what cost?

Temporal Ecosystem Benefits

- Ecological transition means benefits of pre-fire fuel treatment or post-fire recovery or restoration will vary over time.
- Hiking value post fire
 - Initial decline in value
 - Scenic/wildlife recovery with habitat variation
 - Fire sustains attractive ecosystem after time



Cost Benefit – Post Fire

- Salvage logging may recover some commercial timber value, but may also reduce other ecosystem services of public value.
 - Commercial and business links through tourism, recreation, wildlife, landscape amenity are sought by homeowners and communities.
 - Non-market values through endangered species, wildlife, water quality (public health) affect quality of rural living and associated development.
- Economic sense means post-fire actions should produce set of highest value benefits after costs.



Knowledge Gaps

- We face extensive knowledge gaps
 - What are ecosystem service values sought by communities? Which communities?
 - How are they produced? Where?
 - How are ecosystem values affected by pre-fire and post-fire management actions?
 - How do management and policy choices alter incentives for individual actions that exacerbate risks and consequences?
- Government regulations constrain social science research and knowledge development.



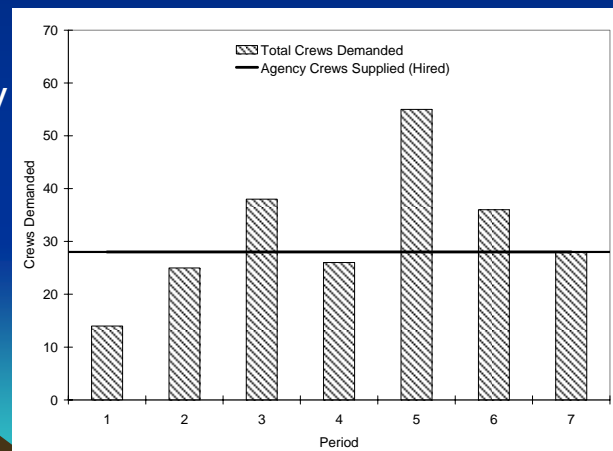
Education

- There are “two faces of fire” – beneficial and detrimental.
- Science-based, public education can alter the perceptions, and realities, of costs and benefits, and facilitate agencies’ ability to use fire as a tool to produce values for society.
- Education reduces human denial about the reality of living with fire.



Wise use of \$\$Billions?

- Proactive investment in integrated research for ecological and social science could return dramatic benefits.
- Example:
Spending on research to balance climate uncertainty and decisions to maintain suppression crews through the fire-season can reduce personnel cost by \$3 to \$22 per \$1 spent on the research. (Prestemon and Donovan in press)



Economics Sciences - Investigating Solutions

- Science must address critical economic questions:
 - Humans critical to fire risk and implications
 - Understanding humans' value, choice and behavior must be a high priority for effective solutions



Acknowledgment

- Jeff Kline, U.S. Forest Service, Pacific Northwest Research Station, Corvallis, OR
- Jeff Prestemon, U.S. Forest Service, Forest Sciences Laboratory, Southeast Research Station, Research Triangle Park, NC
- Greg Amacher, Virginia Polytechnic Institute and State University, Blacksburg
- Philip Omi, Colorado State University, Fort Collins

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Partial support provided by

- Rhode Island Agricultural Experiment Station
- National Science Foundation Long Term Ecological Research Network
- U.S. Dept. Agriculture (U.S.D.A.) Cooperative State Research, Education and Extension Service / National Research Initiative Competitive Grants Program
- U.S.D.A. Natural Resources Conservation Service / Conservation Innovation Grant

