



Social Vulnerability Webinar Series



## Communities, Climate Change, and National Forests

# An Introduction to the Concept of Social Vulnerability

Daniel R. Williams, Rocky Mountain Research Station

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Daniel J. Murphy, University of Cincinnati

Paige Fischer, University of Michigan

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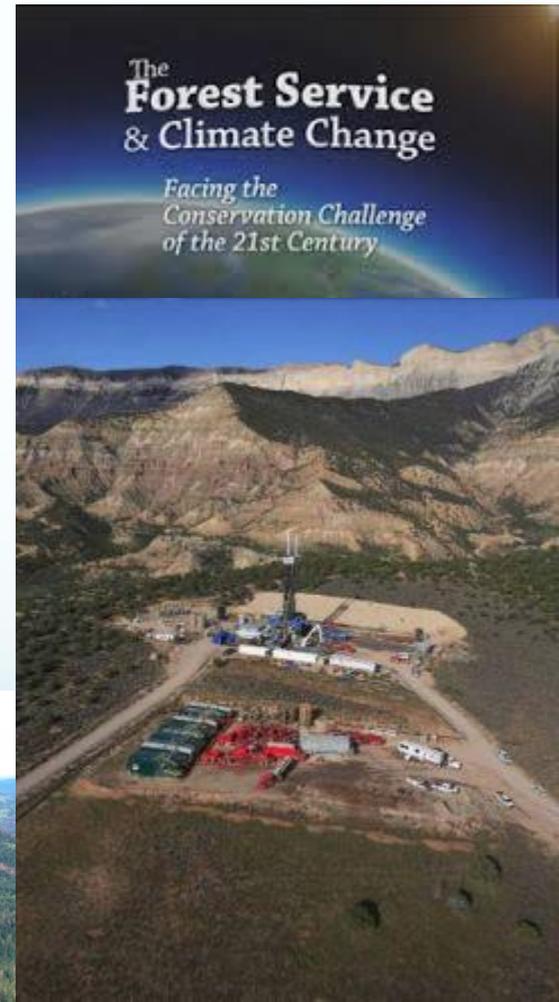
# Social Vulnerability Webinar Series

- A working group initiated by Forest Service Research and Development
- Comprised of Forest Service and University scientists from across the country engaged in various research projects related to social vulnerability to climate change
- Today's Speakers: Daniel R. Williams, Rocky Mountain Research Station; Laurie Yung University of Montana; Paige Fischer, University of Michigan; Daniel J. Murphy, University of Cincinnati



# Climate Change and Public Lands

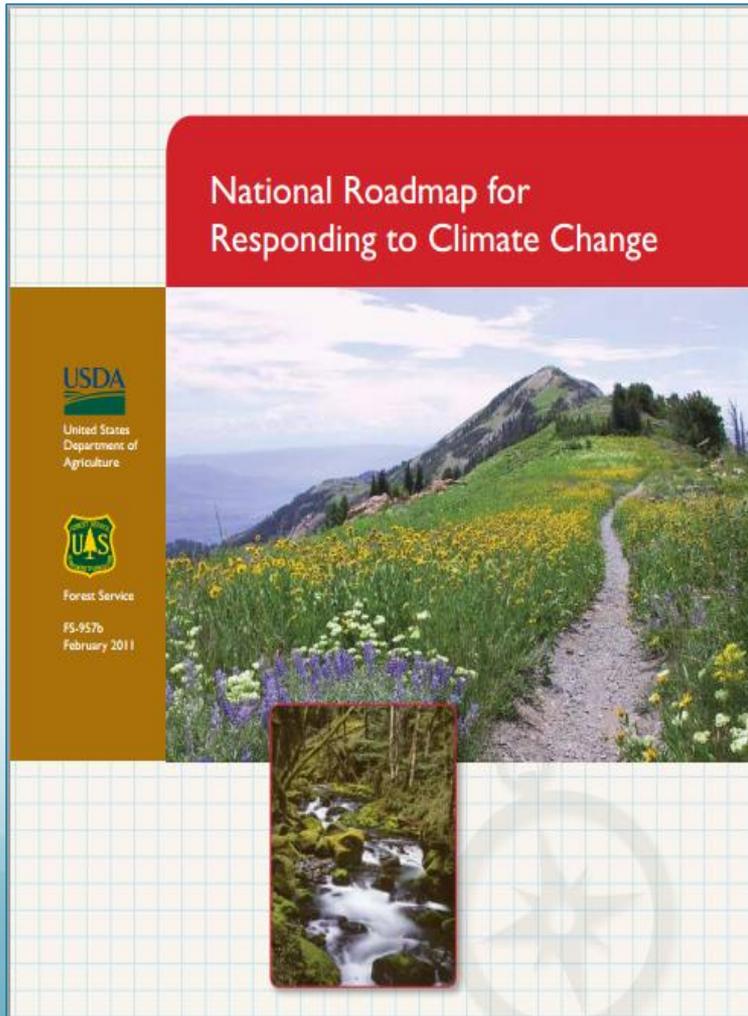
- Mitigation
- Impacts and adaptation
  - How public lands are changing as a result of climate change?
  - What changes are predicted?
  - How will these changes affect ecosystems, species, etc.?
  - ***How will these impacts affect users, stakeholders, local communities, and the public?***
    - i.e., how different groups of people are affected by climate change



The  
**Forest Service**  
& Climate Change

Facing the  
Conservation Challenge  
of the 21st Century

# Policy Context: Why Social Vulnerability?



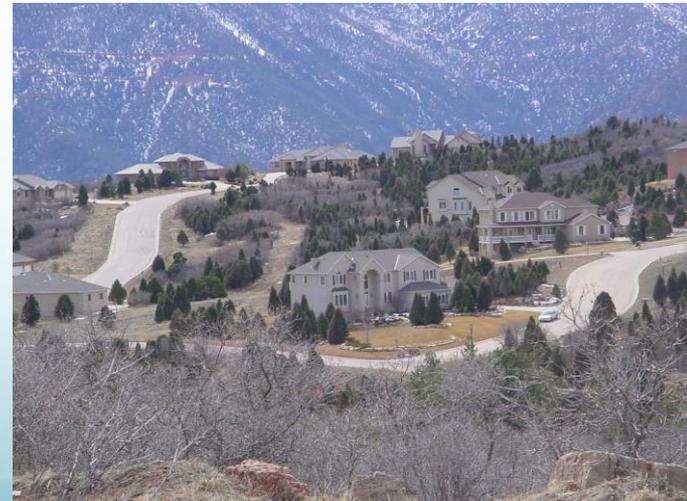
- Land management agencies required to consider and assess impacts of climate change on human communities
  - Strategic Framework for Climate Change
  - National Roadmap for Responding to Climate Change
  - Forest Service Climate Change Scorecard

# Forest Service Climate Scorecard

The Forest Service Climate Change Performance Scorecard, 2010 (version 1.2) To be completed annually by each National Forest or Grassland (Unit).		
Scorecard Element	Please use the template in the guidance document for narratives that support your answers.	Yes/No
<b>Organizational Capacity – engage employees through training and integrate climate change into program of work</b>		
1. Employee Education	Are all employees provided with training on climate change causes, impacts, role of forests and grasslands, and possible responses? Are employees made aware of the potential contribution of their own work to climate change response?	
2. Designated Climate Change Coordinators	Is at least one employee assigned to coordinate and be a resource for climate change questions and issues? Is this employee provided with the institutional support to make his/her assignment successful?	
3. Guidance, Training, Plans of Work	Has Unit leadership developed guidance for progressively integrating climate change activities into Unit-level operations?	
<b>Engagement—develop partnerships and transfer knowledge</b>		
4. Integrate Science and Management	Does the Unit actively participate with the science community to improve its ability to respond to climate change?	
5. External Partnerships	Does the Unit have strategic alliances in place to respond to climate change?	
<b>Adaptation—assess impacts of climate change and manage change</b>		
6. Vulnerability Assessment	Has information relevant to management actions of the Unit level been developed and synthesized to assess the vulnerability of key resources to the impacts of climate change and the interaction with other stressors and human communities?	
7. Adaptation Activities	Is an adaptation strategy in place that helps incorporate the vulnerability of resources and places into priority setting and management actions?	
8. Monitoring	Is monitoring being conducted to track changes in conditions of species, watershed condition, forest and grassland health, and other measures, and the effectiveness of adaptation activities?	
<b>Mitigation and Sustainable Consumption – assess carbon stocks and reduce our Agency footprint</b>		
9. Carbon Assessment	Has information relevant to the Unit level been developed and synthesized to assess carbon stocks and the influence of land management activities and disturbances on potential changes in carbon stocks?	
10. Sustainable Operations	Is progress being made toward achieving sustainable operations targets to reduce energy, emissions, water, and other environmental footprints?	

## Element 6. Vulnerability Assessment:

**Assessment:** Has information relevant to management actions at the unit level been developed and synthesized to assess the vulnerability of key resources to the impacts of climate change, and the interaction with other stressors and human communities?



# Social Vulnerability and the Forest Service Context



- Conservation mission to “meet the requirements of our people in perpetuity”
- Tied to environmental justice goals
- The sustainability of rural resource-dependent communities
- Adopts an “all-lands” (landscape) scale approach
- Supports collaborative governance approach
- Builds organizational capacity to engage with local communities

# What is social vulnerability?

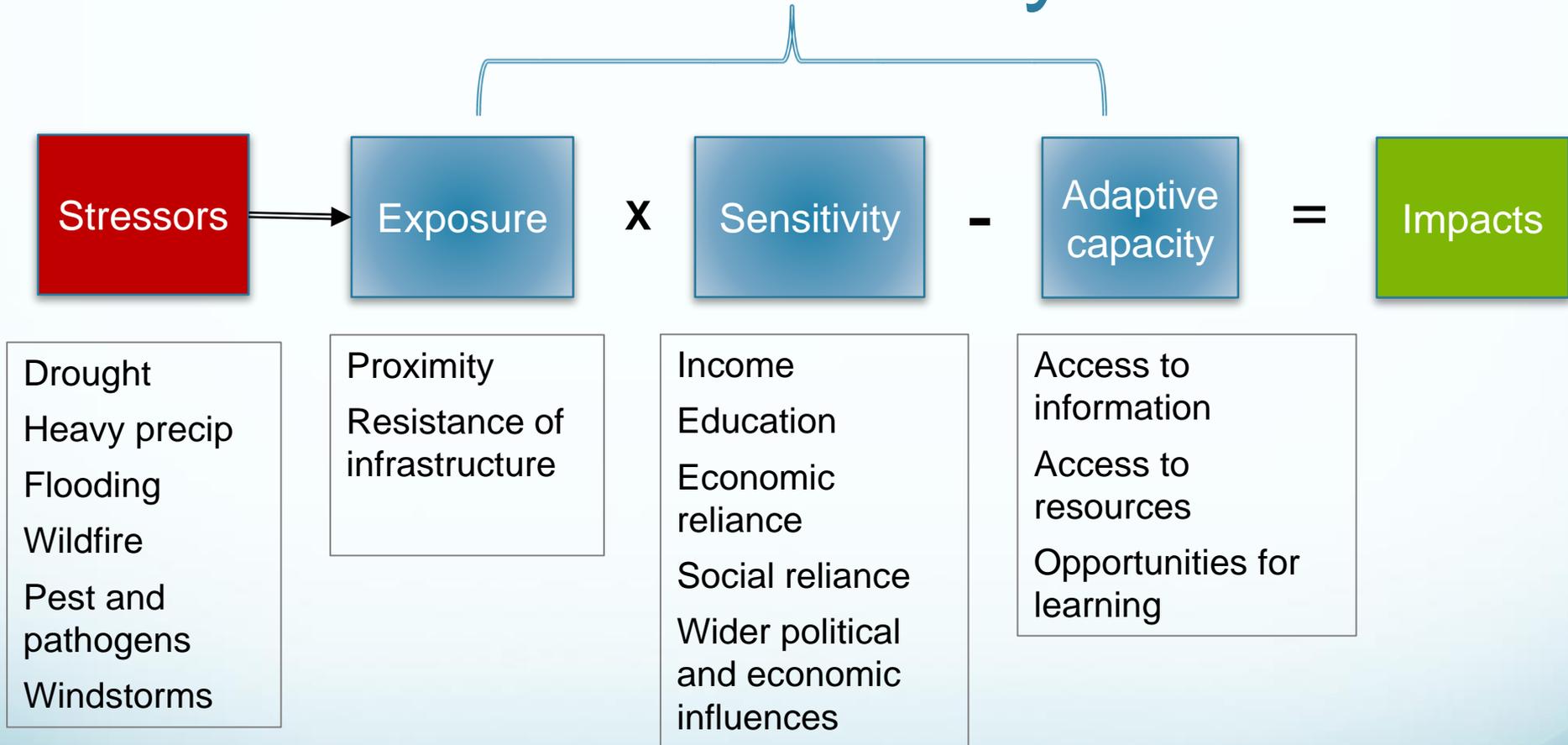
- A concept that helps us understand potential impacts of climate-related changes to human groups or communities
- Rooted in decades of research on why disasters such as earthquakes impact some groups more than others

# Social Vulnerability: IPCC Definition

*The degree to which a system (social or ecological) is susceptible to or unable to cope with or adapt to effects of climate change and associated hazards*

- Exposure: the likelihood of stress on people
- Sensitivity: the potential degree of impact on people
- Adaptive capacity: factors in whether and how people prepare and respond or adapt

# Vulnerability



# Vulnerability



Drought  
Heavy precip  
Flooding  
Wildfire  
Pest and pathogens  
Windstorms

Proximity  
Resistance of infrastructure



Income  
Education  
Economic reliance  
Social reliance  
Wider political and economic influences

Access to information  
Access to resources  
Opportunities for learning

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# What can we learn from investigating social vulnerability?

Exposure	<p>What biophysical conditions or events resulting from climate change may adversely affect human communities or populations that rely on forests and grasslands?</p> <p>Which human communities or populations may potentially be impacted by biophysical changes to forests and grasslands?</p>
Sensitivity	<p>How are different exposed human communities or populations more or less likely to be adversely affected?</p> <p>Which segments of exposed human communities or populations will be impacted to a greater degree?</p>
Adaptive Capacity	<p>What information and resources do exposed and sensitive human communities or populations have access to in order to adapt to or mitigate impacts?</p> <p>What opportunities exist for exposed and sensitive human communities or populations to learn to become more capable of mitigating or adapting to impacts?</p>

# Example: Wildland Fire and Social Vulnerability

## **Exposure**

- Which ecosystems/areas are prone to increasingly frequent or severe fire?
- Who derives value from these ecosystems or areas?

## **Sensitivity**

- Which groups may be more likely to experience adverse impacts from wildfire?
- Which groups may be more capable of recovering from losses due to wildfire?

## **Adaptive capacity**

- What knowledge and resources can people draw on to reduce the chance of losses to fire?
- What programs, organizations or informal networks can people draw on to learn how to reduce or live with?

# Adaptation

Process of change (e.g., a new practice or behavior) in response to change in physical or social environment. Ability to change is determined by access to resources and capacity to cope. More vulnerable groups may have lower capacity to adapt.



# Why Adapt?

- To maintain functioning ecosystems (e.g. conserve biodiversity, preserve ecosystems services)
- To build resilient human communities (e.g. communities that can weather change and remain vibrant, socially and economically).



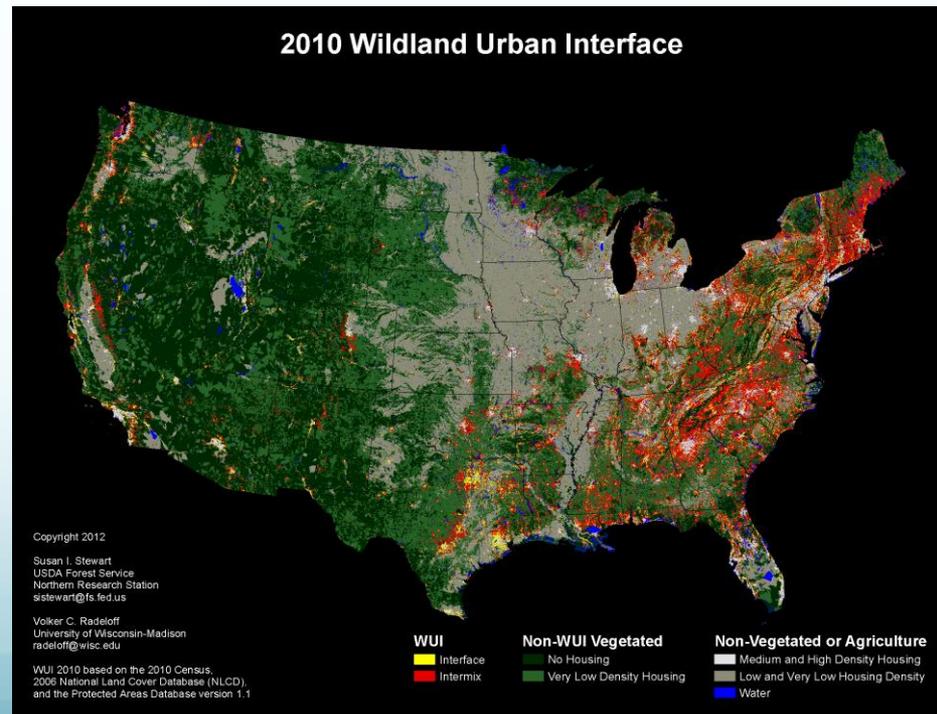
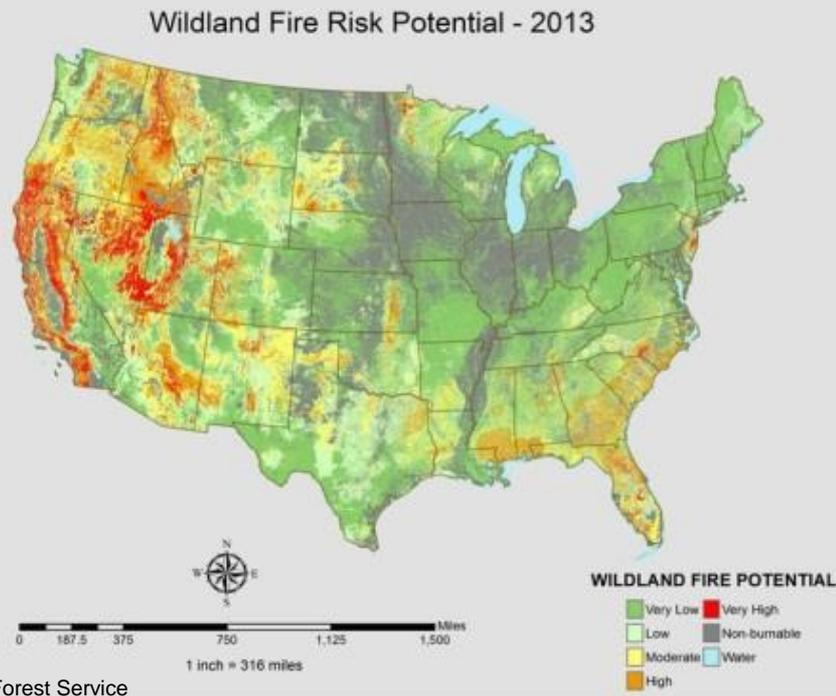
# Components of Adaptive Capacity

- Availability and equitable distribution of resources
- Awareness of relevant risks
- Understanding of local ecosystems
- Ability to obtain, generate, and apply new knowledge
- Capacity to make decisions and act collectively
- Effective structures for decision-making and governance



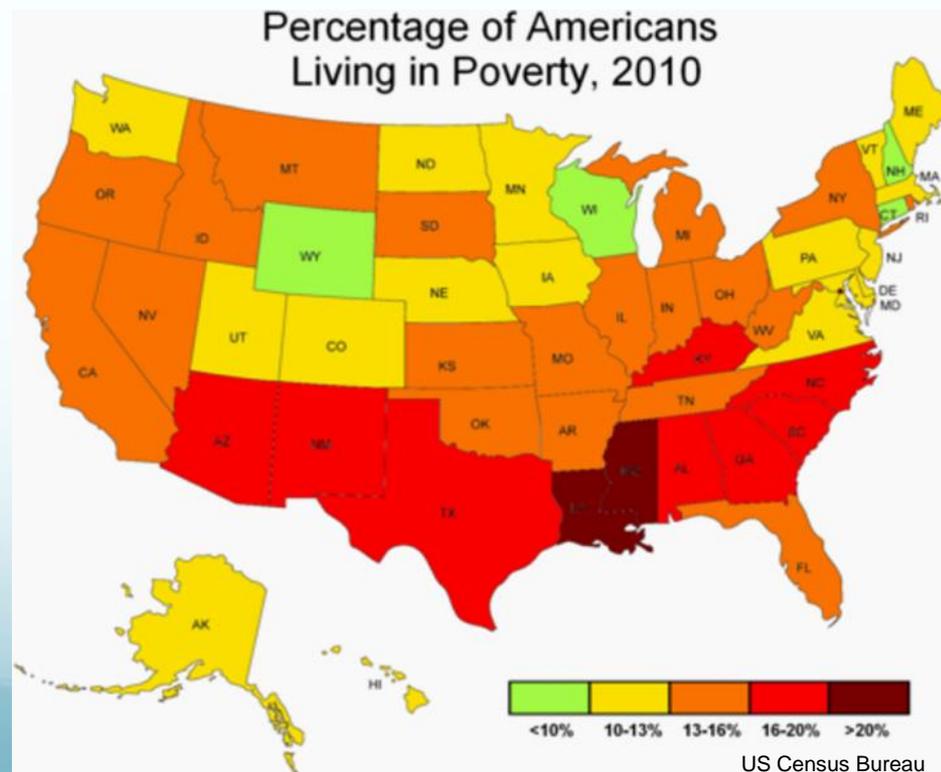
# How do we know where people are vulnerable?

- In some cases, we can map where people are relative to specific climate impacts (e.g. droughts, floods, fires) to understand exposure

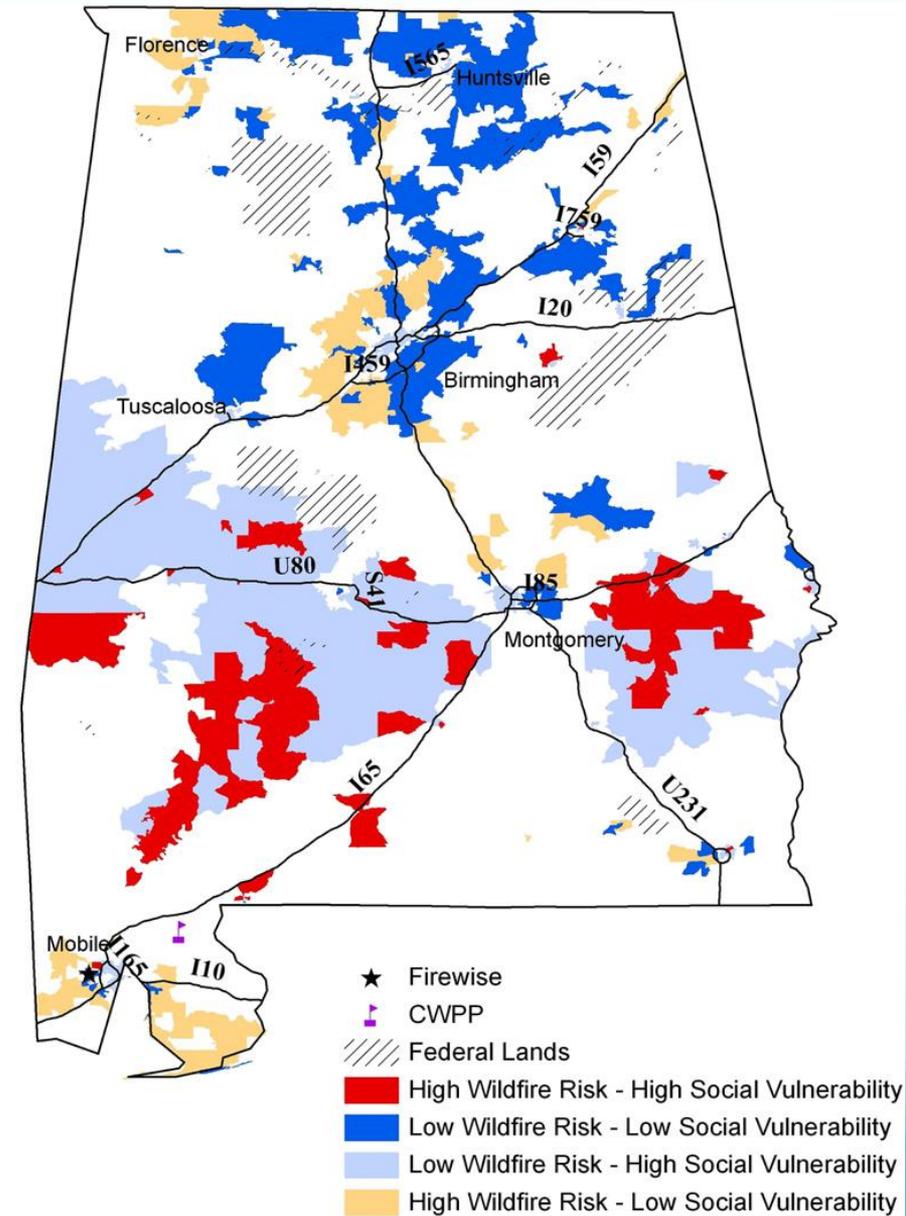


# How do we know who is vulnerable?

- In some cases, we can examine existing data on poverty, education, and other socioeconomic factors to understand sensitivity



When we overlay this information, we can paint a spatial picture of both exposure and sensitivity.



Note: The clusters are based on bivariate LISA Statistic significant at  $p = 0.05$   
White areas represent census block groups where the association is insignificant

# Vulnerability in Rural Communities

- Disproportionately EXPOSED to climate change impacts due to proximity to ecological systems that will be affected:
  - Wildfire
  - Drought
  - Floods
  - Storm events
  - Forest pests and pathogens
- Disproportionately SENSITIVE to climate change impacts due to reliance on and interdependencies with products and services from those ecological systems:
  - Tourism
  - Recreation
  - Water
  - Timber
  - Grazing
  - Fisheries



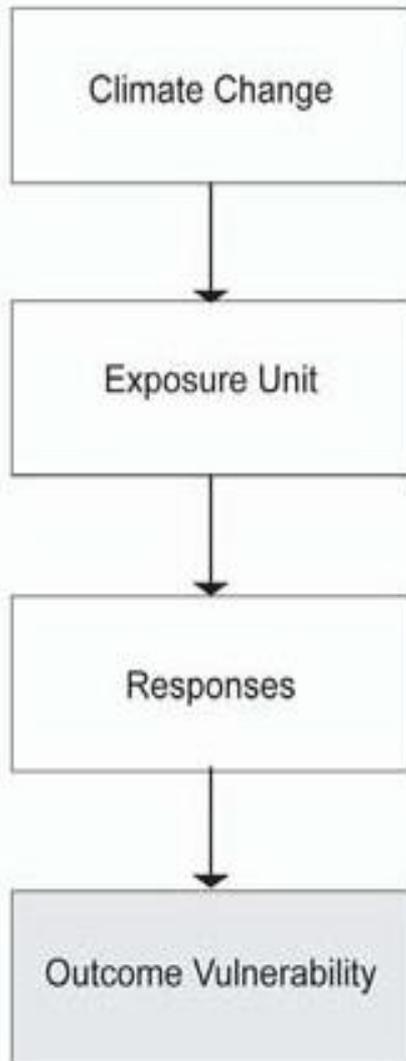
Montana Fly Fishing Guides



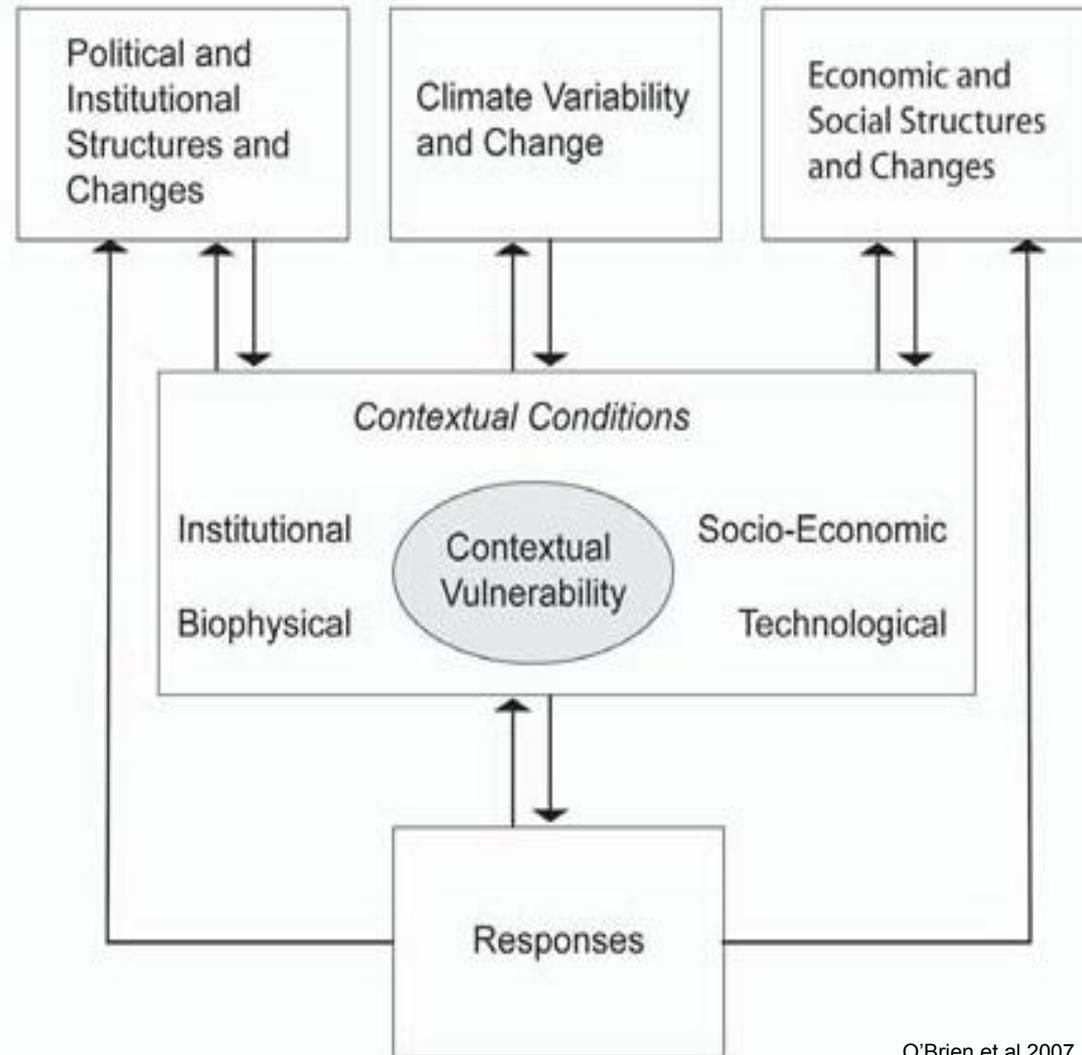
# What makes some people more vulnerable than others?

- Some people live or work in landscapes/ecosystems that experience climate impacts (biophysical information – helps us understand exposure)
- Some people are disadvantaged and/or more susceptible to harm from climate impacts (**profile information** – use demographic characteristics to gain insight into sensitivity)
- Some people are better able to mobilize knowledge, resources, and networks to reduce vulnerability and adapt (**process information** – examine how social processes interact to produce and reduce vulnerability and adaptive capacity)

# Outcome Vulnerability



# Contextual Vulnerability





Northern Nomad

# Community Complexity and Contextual Vulnerability



Robin Loznak/  
Daily Inter Lake  
7/19/2003

# Implications for Integrating into Land Management

- Different ways to understand social vulnerability, which can inform different kinds of management decisions
  - Spatial scale of decisions
  - Profile versus process in vulnerability
- Identify key relationships that might be at risk
- Highlight counter-productive socio-economic trends that might conflict with or undermine management goals
- Identify resource and knowledge gaps in communities that could be filled by management agency
- Identify opportunities and trends to promote or pursue new goals or avenues for collaboration and engagement

# Future Webinars

- |                   |  |
|-------------------|--|
| February 11, 2015 | Engaging Uncertainty through Scenarios   |
| February 25, 2015 | Exploring Social Vulnerability through Regional Socio-Economic Assessment            |
| March 11, 2015    | Employing Q-methodology for Vulnerability Assessment                                 |
| March 25, 2015    | Using Existing Socioeconomic Data to Understand Vulnerability                        |
| April 8, 2015     | Understanding Risk and Exposure in an Urban Case Study                               |
| April 29, 2015    | A GIS Approach to Assessing Population Vulnerability to Smoke in the Southeastern US |
| May 6, 2015       | Integrating Social Vulnerability into Planning and Decision-Making                   |

# Further Reading

- Fischer, A.P., Paveglio, T., Carroll, M., Murphy, D. and H. Brenkert-Smith. 2013. Assessing social vulnerability to climate change in communities near public forests and grasslands: A framework for resource managers and planners. *Journal of Forestry* 111(5):352-369.
- Lynn, K., MacKendrick, K. and E. Donoghue. 2011. Social vulnerability and climate change: Synthesis of literature. Gen. Tech. Rep. PNW-GTR-838. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 70 p.
- Murphy, D. J., Wyborn, C., Yung, L., & Williams, D. R. (in press). Key concepts and methods in social vulnerability and adaptive capacity. RMRS-RP-xxx. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- O'Brien, K., Eriksen, S., Lynn, P.N. and A. Schjolden. 2007. Why different interpretations of vulnerability matter in climate change discourses. *Climate Policy* 7(1):73-88.

# Questions and Discussion

