Climate Change Adaptation in Working Landscapes of the Intermountain Northwest

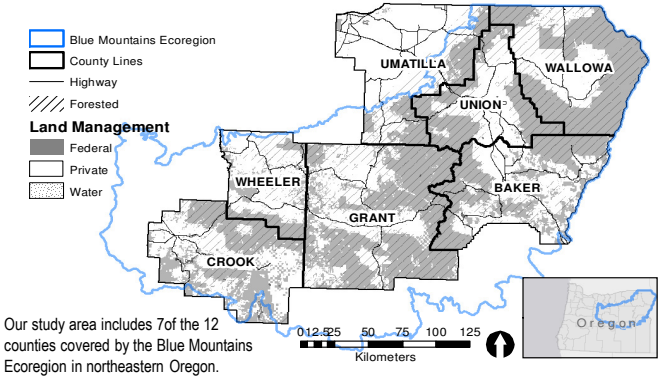
A Communities and Forests in Oregon Project

Joel Hartter[1,3], Mark J. Ducey[2,3], Lawrence C. Hamilton[2,3], Michael W. Palace[2], Forrest R. Stevens[4], Nils Christoffersen[5], Paul Oester[6], Angela E. Boag[1], James Perkins[2], Franklin Sullivan[2]

[1]University of Colorado, Boulder, CO
[2]University of New Hampshire, Durham, NH
[3]Carsey School of Public Policy, University of New Hampshire, Durham, NH
[4]University of Louisville, Louisville, KY
[5]Wallowa Resources, Enterprise, OR
[6]Oregon State University Forestry and Natural Resources Extension, La Grande, OR

BACKGROUND

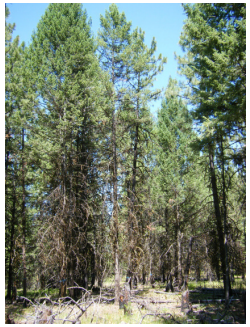
A decade into the 21st century, rural communities are at a transition. Traditional livelihoods in natural resource-based sectors have been eroded by changing markets and policies, resulting in significant demographic change. The effect of climate change on fire regimes has been exacerbated by contemporary changes in land-use patterns and fire suppression efforts, causing fuels to accumulate and risk of large fire to increase. Forecasted growth of large-scale natural disturbances in North American forests, such as insect outbreaks and catastrophic wildfire, have the potential to cause large, abrupt releases of carbon (C), accelerating future climate change. They would also inflict heavy socio-economic costs.



Our study area includes 7of the 12 counties covered by the Blue Mountains Ecoregion in northeastern Oregon.

OBJECTIVES

This study will provide an integrated social and biophysical assessment of vulnerability and adaptation to climate change and variability in the Blue Mountains Ecoregion of Oregon.



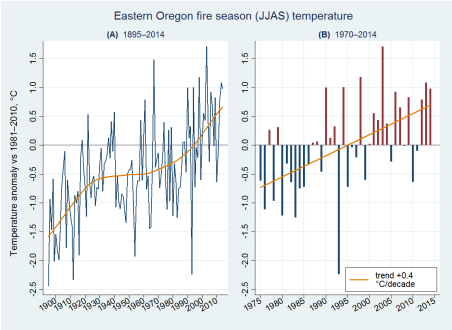
- Quantify the current range of variation in forest conditions with a focus on small private landowners, and assess current landowner strategies for mitigating climate variability in forest and silvo-pastoral systems
- Examine historic range of variation, current range of variation, and "business as usual" projections of future variability to target and prioritize strategies for improving forest resilience to an uncertain and variable future climate
- Use best available data, IPCC scenarios, and climate matching techniques to enable landowner visualization of potential climate risks over the mid-term (10-30 years)
- Analyze multivariate relationships between perceptions of climate change and strategies for adaptation and mitigation, separately among general public and forest-landowner populations
- Use our findings to probe the mindset of stakeholder groups, collaboratives, and institutions regarding climate variability to learn how uncertainty is factored into *and prioritized* for management decision-making

PRIMARY GOALS & APPROACH

Our study will test relationships between perceptions about climate variability and adaptive behavior by:

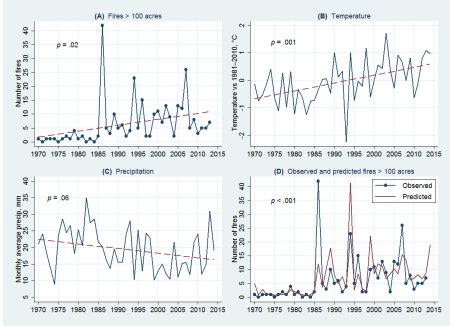
- **Characterizing landscape change, integrating medium and high-resolution satellite and aerial imagery with vegetation sampling**
- **Combine forest characteristics with disturbance, drought, and weather data, and integrate those with general public and landowner views measured by two surveys to test relationships between environmental and social domains**
- **Characterize climate variability over the historical record using data at multiple scales**
- **Integrate results for climate and ecological literacy and management using scenario planning to reach stakeholders through "K-grey" education and extension programs**

CLIMATE & WILDFIRE



June through September temperature anomaly in eastern Oregon 1895–2014, with lowess regression curve (A); June through September temperature anomaly 1975–2014, with linear trend (B). Data: NOAA climate divisions 6, 7, 8 and 9.

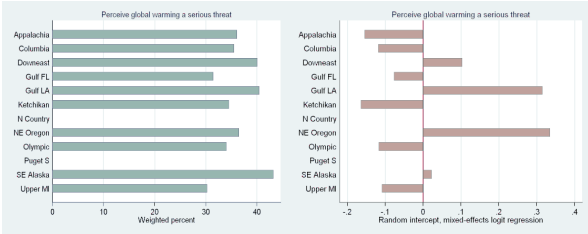
Between 1975 and 2013, there has been a 0.8 degree F increase in temperature per decade trend, which is twice the global average increase.



Number of medium to large (>100 acres) wildfires in eastern Oregon 1970–2013 (A); fire season mean temperature anomaly (B); fire season monthly average precipitation (C); and negative binomial regression model predicting number of fires from fire-season temperature, precipitation, drought severity, number of smaller ignitions by lightning (proxy for thunderstorm intensity), and a linear trend (D).

Acknowledgements: This research was supported by the United States Department of Agriculture's Agriculture and Food Research Initiative (AFRI) Agricultural and Natural Resources Science for Climate Variability and Change grant 2014-68002-21782

LOCAL PERCEPTIONS



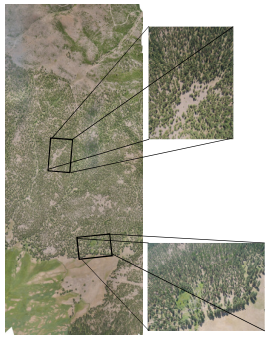
Perceive global warming as threat: percentages from 10 rural surveys, and regional mean random intercepts from mixed-effects logit model adjusting for background and political views (authors, CAFOR/CERA data).

In previous CAFOR research in Wallowa, Union, and Baker Counties, we found high concern among residents about wildfire danger, which 74% consider a "serious threat" to their communities. Only 37% consider global warming a serious threat, which is low but not exceptional among rural regions (left panel above).

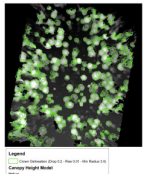
Beliefs about climate change have well known demographic bases: concern tends to be lower among older, less educated, and politically conservative respondents. The CAFOR region population tends to be older, less educated and more conservative compared with Oregon or the US as a whole. The right panel above graphs random intercepts from a mixed-effects logit regression model involving the same 10 surveys. Once we adjust for individual age, education and political outlook, the mean perceived threat of global warming is *comparatively higher in NE Oregon* than in the other 9 rural regions. This unobvious conclusion fits with the observed warming/wildfire trends, and public concern about wildfire. It illustrates the potential for multivariate analysis to detect real and policy-relevant patterns that lie below the surface of public perceptions.

IMPACT

This project's impacts and outcomes will expand the philosophy of integrated research, education, and engagement, education and training, build research capacity and foster interdisciplinary collaborations. We will share results to support more resilient forests, adaptive management, and robust community responses. This project will contribute directly to ongoing land use planning and resource management work as part of Wallowa Resource's mission of land stewardship, as well as OSU extension programs. The collaborations and education promoted by this research will enhance the capacity of local governments, non-profit groups, collaboratives, and local people.



Unmanned aerial system image collected using a Robota Triton XL fixed-wing and a Panasonic Lumix-GM. Image is a composite of 700 images with overlap allowing for parallax analysis of tree heights. Image size is approximately 6 km by 1.5 km.



Exported x,y,z information from parallax image used to generate a canopy height model with a crown delineation algorithm applied.