Forest landowner adaptation to climate change and its influence on wildfire

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Main questions or issues that you addressed

In addition to its effect on the wildfire regime, changing climatic conditions conceivably will induce behavioral changes in how private forestland owners manage their lands—including whether they will thin or not, when or if they might harvest, and what tree species they might plant following harvest. These behaviors also will be influenced by secondary changes to wildfire regimes that climate change brings about. Recent studies suggest that private forestland owners respond to fuel and other landscape conditions that determine wildfire risk, as well as the occurrence of wildfire itself. Developing methods and behavioral models with which to support effective landscape-level strategies for managing wildfire risk necessarily includes consideration of private landowners' adaptation to a changing climate as well as related changes in wildfire potential.

Location and ecosystem investigated

Our study area included private-owned forestland of California, Oregon, and Washington. The study area has a substantial portion of its landscape dedicated to commercial forest production, including some of the most productive forests in the world. Portions of the study area are becoming more susceptible to natural disturbance, including wildfire.

Key Findings of Your Research

Changing climate is expected to alter forest conditions on private forestlands directly via changes in temperatures and precipitation, for example, as well as indirectly via shifts in the harvest timing, intensity, and replanting choices of private forestland owners. This is in addition to any landscape changes brought about by a changing wildfire regime in response to a changing climatic conditions. In particular, changing climatic conditions are expected to alter landowners' relative preferences for planting particular tree species following harvest. Most notably, our analysis suggests that climate change will induce moderate shifts away from Douglas fir in favor of Ponderosa pine and hardwoods, and associated increases in wildfire, particularly in the western Cascades of Oregon and Washington. The adaptive behaviors of private forestland owners likely can be influenced by public policies designed to incentivize particular behaviors.

How Did You Answer the Main Questions or Inform the Issues?

We developed an empirical model describing the forestland owners' harvest and post-harvest re-planting decisions as a function of expected economic returns as determined by forest stand conditions, disturbance potential (e.g., wildfire) and severity, climate factors, and timber prices. Data come from the USDA Forest

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Service's Forest Inventory and Analysis program, the U.S. National Center for Atmospheric Research, and other sources. We characterized disturbance potential using an empirical model developed from historical data describing past natural disturbances. We used these empirical models and data to project future private forestland owners' forest management activities in response to changing climate and its likely effects on disturbance potential and severity.

How Might/Will It Influence Fire Management Decisions or Practices?

Understanding private forestland owners' forest management activities and the role they play in influencing landscape-level fuel conditions is viewed as critical to mitigating wildfire risk, especially in the western US. Moreover, addressing landscape-level wildfire risk ideally requires fuel management and fire protection strategies that are synchronized among landowners—public and private Our projections anticipate and demonstrate how private forestland owners' adaptation to climate change and wildfire are likely to occur iteratively in response to the combined influences of landscape, economic, and climatic factors, as well as wildfire risk. Our analysis provides an example of how to combine analyses of the biophysical and social dimensions of wildfire risk, to facilitate wildfire risk mitigation planning in anticipation of climate change.

Who Is the Main End-user of Your Research?

End users of this research include other researchers applying socio-ecological approaches to understanding how best to manage wildfire risk, as well as forest managers concerned about whether and how private forestland owners might adapt to climate change and wildfire.

Congress Session

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