Climate Impacts Group

# Forest Fire and Climate

July 2004

## Summary Points

- Different forests have different fire regimes
- Climate has a strong influence on fire regime
- Different forest types have different sensitivities to climate change.
- Adapting or mitigating for fire in the future should consider forest vulnerability on a forest type basis.

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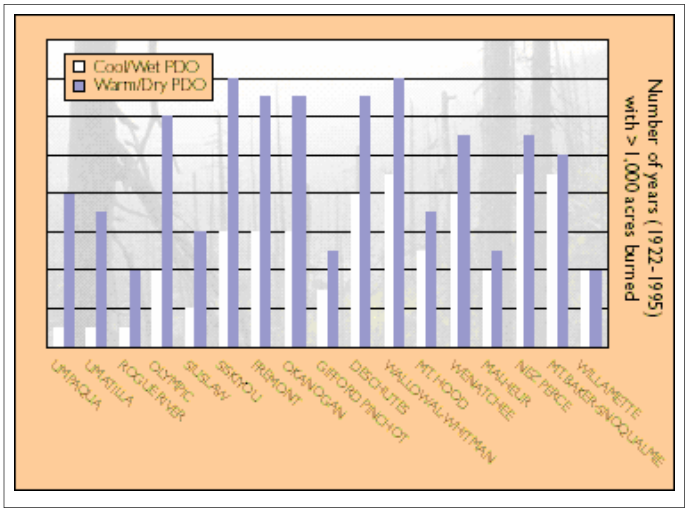
## Fire, Climate, and Forest Vulnerability to Climate Change

### Fire Regimes in the Pacific Northwest

Fire regime refers to the characteristic role of fire in an ecosystem, especially the extent, intensity, and frequency of fires. Fire history reconstructions from tree rings and lake sediment indicate fire has been a prominent natural disturbance of PNW forest ecosystems since at least the end of the last glaciation over 12,000 years ago.

A key theme of such research is that different types of fire regimes are associated with different climates and forest types. For example, fire in dry ponderosa pine forests in the interior Columbia Basin typically returned to a site every 7 to 15 years prior to European settlement. In contrast, coastal temperate rainforest ecosystems in British Columbia experienced fire as rarely as once every few millennia .




**Relationship between the Pacific Decadal Oscillation and fire area burned for national forests in Oregon, and Washington 1922-1995.**

### Fire and Climate

Drought increases the likelihood of fire, and over the course of decades or centuries, shifts in climate may shift fire regimes. During the 20th century, the Pacific Decadal Oscillation has had a detectable influence on the area burned by fire in the PNW. In the dry interior northwest forests for the period 1690 to 1995 A.D., larger fires burned in El Niño years. These patterns illustrate the role of climate in PNW fire and provide examples of what climate change impacts might mean for future fire activity. Projected temperature increases during the 21st century could lead to larger and/or more frequent fires in drier climates if trends forecast from climate models occur, especially if precipitation does not increase.

*A low intensity fire*

***Climate change impacts to forest fire regimes are likely to be highly place dependent.***

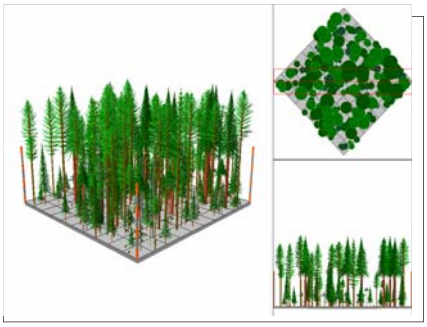
# *Fire Regimes, Fuel Accumulations, and Climate Change: Regional and Local Effects*

## Mechanisms of Vulnerability

Climate change is likely to increase temperatures and the length of the snow-free season. At a regional scale, this translates into an increase in the frequency of years in which fires burn substantial areas of forested land. The impact of decadal and inter-decadal climate variability may also produce episodic fires. Indirectly, mortality associated with insects and fire may play a more prominent role in the future as well.

## Forest Vulnerability to Climate Change and Fire

Ponderosa pine forests that had shorter fire regimes prior to European settlement and have experienced fire exclusion during the 20th century may be less resilient to future fires because infilling by young trees has the potential to increase fire severity. Forests on the western slope of the Cascades may be more frequently at risk of natural stand-replacing fires. These forest types represent two ends of a spectrum of climate/fire/forest type interactions. The impact of climate change and climate variability on each forest type is thus likely to vary with forest history and physical setting as well as climate.



**Fuel modeling may provide strategies for mitigation projects (Envision, USDA)**

## Mitigate or Adapt?

One large source of uncertainty in our understanding of what future forest changes in response to climate and fire will look like is to what degree forests can be managed for resilience. In drier forest types with lower productivity, fuel is often a limiting factor for fire intensity and severity. In such a case, it may be possible to mitigate fuel loads and attempt to 'buffer' forests to fire and climate change. On the other hand, high productivity forests have plenty of fuel, but are rarely dry enough to burn with high intensity. Drought is much more difficult to mitigate than fuels, and in such forests, socioeconomic, political, and managerial adaptation to the increased risk of fires with climate change may be key.

## For More Information

For more information on the impacts of climate variability and change on Pacific Northwest forest resources, please contact the Climate Impacts Group.

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