

FOREST GROWTH AND CLIMATE CHANGE

June 2004

TEMPERATURE AND PRECIPITATION HAVE INCREASED DURING THE LAST CENTURY IN THE PACIFIC NORTHWEST. BECAUSE ATMOSPHERIC CONCENTRATIONS OF GREENHOUSE GASES CONTINUE TO RISE, THIS TREND MAY CONTINUE INTO THE FUTURE. ALTERED TEMPERATURE AND PRECIPITATION CAN AFFECT THE DISTRIBUTION, COMPOSITION, AND GROWTH OF FORESTS, AND IMPACTS WILL VARY ACCORDING TO FOREST TYPE AND SPATIAL AND TEMPORAL SCALES.

Summary Points

Climate change will affect:

- Tree growth
- Species composition
- Forest extent

Which, in turn, will affect the ability to attain management objectives.



Climate Impacts Group
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GROWTH

Growth will be among the first forest attributes to be affected by climate change.

Changes in growth will be a result of the interaction of changing climatic variables and growth limiting factors (i.e., growing season length, soil moisture availability, etc.).

Projected climate changes will likely lead to the following:

- Decreased snowpack (except at very high elevations)
- Longer growing season
- Decreased summer soil moisture availability

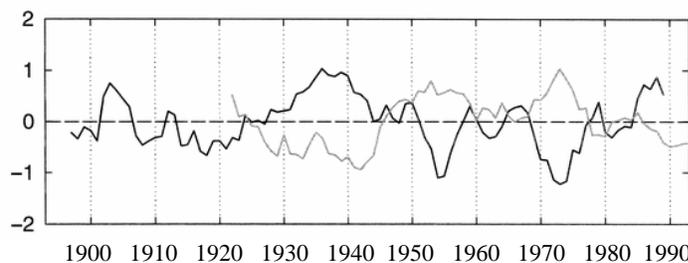


Figure 1. Time series plot comparing 5-year running averages of normalized high-elevation mountain hemlock (*Tsuga mertensiana*) growth variations (black lines) and May 15th snowpack depths (gray lines) at Mount Rainier National Park. Relationship is negative ($r^2 = 0.47$). Figure is adapted from Peterson & Peterson 2001.

As a result, high-elevation species could increase in growth, and species sensitive to moisture availability (i.e., Douglas-fir and ponderosa pine) could decrease in growth at some locations.

COMPOSITION

Changes in tree species distribution and abundance may take place on

longer temporal scales:

- Individual species will adapt differently
- Competitive interactions will likely change
- Cover types and biodiversity will be affected
- Invasive and exotic species may increase



Tree encroachment into alpine meadows.

Managers can adapt their practices to decrease overall vulnerability to climate change.

PNW FOREST GROWTH AND CLIMATE CHANGE

FOREST EXTENT

The extent of forest cover will be affected by growth limiting factors over longer time scales.

There may be a reduction in total PNW forested area as a result of drought stress and the inability of species to adapt to rapid climate change.

Additional possible impacts to forest extent include:

- Increase in the elevation of upper treeline
- Increase in the elevation of lower treeline (due to longer drought season)

MANAGEMENT IMPLICATIONS

Seasonal/annual climate forecasts and long-term climate predictions offer the potential to enhance management practices.

Management objectives that could be impacted by climate change include: growth and productivity, carbon storage, regeneration, biodiversity, and resilience to future disturbances

Potential actions for commercial landowners interested in managing for timber and carbon objectives include:

- Diversify regeneration stock
- Plant more drought tolerant species in soil moisture limited areas
- Prioritize prescribed burns during low fire hazard years

- Consider thinning in densely populated stands to improve vigor and minimize fire risk

Climate projections may help managers assess potential changes in tree growth, species composition, and forest extent, which may be helpful for both commercial and non-commercial landowners.

FUTURE RESEARCH

Additional research should consider the following:

- Identify and monitor sensitive forests
- Develop more accurate, local climate models to better predict potential changes in climate

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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