Summary Points

- Climatic reconstructions indicate that climate changes at a variety of temporal scales.
- Forest species have responded to climate change individually rather than as intact communities.
- In the past, the effects of climate change on forests have been mediated by changes in disturbance regimes, such as fire.

Forest Ecosystem Change

Records of forest history indicate that vegetation changes at almost all temporal and spatial scales in response to climate change.

Many forest communities on the present landscape are recent additions, and many communities of the past have no modern-day counterparts.

- Species we see on the landscape today evolved under widely varying climatic conditions.
- Our understanding of species response to climate comes from the narrow range of possible conditions from data collected in the recent past.

Understanding Climate History Allows Scientists to Better Anticipate Forest Response to Future Climate Variability and Change

Figure 1. Ice cores, lake-sediments, and tree rings provide continuous records of past environmental change to help place predicted climate change in a historical context. Since the last glaciation, temperatures in central Greenland1 reconstructed with oxygen isotopes from an ice core indicate temperature variability at a variety of temporal scales. More recently, temperature reconstructions (blue line)2 indicate that recent warming (red line) is unprecedented within the last 1,000 years.

Lessons from the Past: Vegetation

With past climate change, individual species within a community responded uniquely to new climatic conditions. This implies that future forest communities could be composed of novel species assemblages with little or no precedent.
This rate of future climate change may outpace the ability of species to adapt and/or migrate. As a consequence, in some places future forests may have little resemblance to the modern landscape.

Disturbance regimes respond directly to climate variability, and the ultimate effects on forests depend on interactions between climate, vegetation, and site-specific factors.

Altered species distribution and abundance may affect productivity, carbon cycling, and wildlife habitat.

Estimates of future temperature increases are for > 2 degrees C in the next 100 years (IPCC, 2001: www.ipcc.ch).

Implications
1. Forest communities are dynamic and will change at a variety of spatial and temporal scales in response to climate change.
2. The range of past variations in climate and forests can be used to provide a context in which to view future change and management options.

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. Photo credits: Linda Brubaker, Chris Earle.