

Climate Impacts Group

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The Climate Impacts Group (CIG) is an internationally recognized interdisciplinary research group studying the impacts of natural climate variability and global climate change at spatial scales ranging from local communities to the entire western U.S. region, with most work focused on the Pacific Northwest (PNW) (Figure 1).

Through research and interaction with stakeholders, the CIG works to increase community and ecosystem resilience to fluctuations in climate. We perform fundamental research on climate and climate impacts and work with planners and policy makers to apply this information to regional decision making processes.

Since its establishment in 1995, the CIG has developed extensive collective expertise that includes the following areas:

- downscaling global climate model projections;
- regional climate modeling;
- hydrologic modeling;
- water resources and terrestrial/aquatic ecosystem modeling and impacts assessment;
- coastal impacts assessment;
- climate change vulnerability assessment;
- adaptation planning; and
- outreach and education.

The CIG is part of the Joint Institute for the Study of the Atmosphere and Ocean in the University of Washington's College of the Environment.

Climate Science in the Public Interest

The CIG engages in *climate science in the public interest*, conducting original research on the causes and consequences of climate variability and change for the PNW in a manner that supports the use of this information in federal, state, local, tribal, and private sector resource management decisions.

The CIG's unique focus on the intersection of climate science and public policy has placed the CIG nationally at the forefront of regional climate impacts assessment and integrated analysis. Recent and ongoing projects include, but are not limited to, the following:

- *High-resolution Regional Climate Scenarios for Impacts Studies*. Climate impacts studies require scenarios of climate change at very high spatial



Figure 1. Research at the CIG ranges in scale from the local level to the U.S. West. Most work is focused on the Pacific Northwest, which includes the states of Washington, Oregon, and Idaho, and the Columbia River Basin (highlighted).

resolution and at temporal resolution of daily or hourly time steps. In this project, we are using statistical downscaling and a regional climate model to produce regional climate scenarios to support climate impacts studies.

- *Climate, Air Quality and Wildfire*. In this project, we are using an ensemble modeling approach that will address the impacts and uncertainties related to the effects of global change on regional air quality in the U.S.
- *The Columbia Basin and Coastal Drainages Climate Change Scenarios Project*. We have developed a comprehensive streamflow scenarios database incorporating 21st century climate change projections at a range of spatial (smaller sub-basin to entire basin) and temporal scales in the Columbia River basin and coastal drainages (Figure 2). The data and related synthesis products, which are publicly available at no charge, are being used in planning efforts associated with salmon restoration, water supply, flood control, and hydropower production.

- *Washington Assessment of Climate Change Impacts.* The Washington Assessment is an integrated assessment of the effects of climate change on eight ecologically and economically important sectors in Washington State: public health, agriculture, the coastal zone, forest ecosystems, salmon, infrastructure, energy, and water supply and management. Completed in 2009, the assessment is providing the technical basis for adaptation planning efforts by the State of Washington.
- *Paleoreconstructions of Pacific Northwest Streamflow.* Paleoclimatic streamflow reconstructions derived from proxy records (such as tree-rings) play an important role in water resources planning and management. Previous efforts to reconstruct streamflow in the Columbia River in the PNW showed limited ability to reproduce interannual variations in streamflow. This study attempts to improve on existing methods both by increasing the number and quality of proxy records available and by investigating a broader range of climatic zones and spatial scales.
- *Direct Impacts of Climate on Forest Growth, Disturbance and Function.* This work uses basic research in climate-vegetation relationships to provide estimates of future changes to forests of the

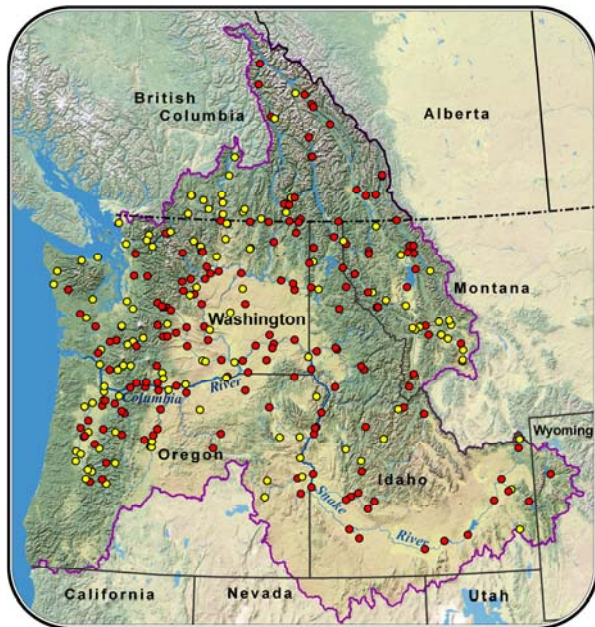


Figure 2. The Columbia Basin and Coastal Drainages Climate Change Scenarios Project includes hydroclimate data for approximately 300 streamflow locations in the Columbia River Basin. Red dots indicate sites that are essentially unimpacted by human use or for which there is estimated modified or naturalized flow. Sites without natural flow estimates are shown in yellow. See <http://www.hydro.washington.edu/2860/> for more information on the project and its products.

PNW in direct response to changing climate. We are also investigating the linkages between climate (precipitation, temperature, water balance deficit, and soil moisture) and area burned by fire in different ecosystems of the PNW.

- *Effects of Climate on Juvenile Salmon Survival in the Freshwater Environment.* Changing hydrologic conditions associated with climate change have the potential to affect freshwater survival of PNW salmonids via a number of impact pathways. In this work, we are exploring potential differential responses of the viability of four salmon populations in the Salmon River (ID) and Wenatchee River (WA) basins.

Work with Regional Stakeholders

The CIG has developed close connections with resource managers and decision makers throughout the public, private, and tribal groups and agencies responsible for managing the PNW's communities and natural resources.

These relationships, which extend from the technical operations managers to senior level policy makers and elected officials, help ensure that the CIG's research results in information and products that are not only *useful* but also *used* to shape resource management decisions in the PNW. Recent stakeholder collaborations include:

- Development of climate change scenarios, streamflow projections, and projected changes in fish habitat for Seattle City Light;
- Development of the Columbia Basin and Coastal Drainages Climate Change Scenarios Project database, which was done in partnership with several federal, state, and local resource management agencies;
- Development of climate change scenarios for the U.S. Forest Service's Regions 1 and 6; and
- Providing technical guidance to climate change adaptation planning efforts by the State of Washington, the Swinomish Indian Tribal Community (WA), and the Washington Department of Transportation, among others.

The CIG develops and maintains these connections through a variety of activities, including meetings and workshops, presentations, special research partnerships, and technical assistance in the application of climate information to resource planning and management. The continued dialogue afforded by these interactions plays a large role in CIG's ability to effect change within the region.

For more information on the CIG's research, please contact the CIG at 206-616-5350.