Drought projections in the Pacific Northwest and Northern Rocky Mountains

Drought conditions can contribute to tree stress, increasing the risk of wildfires, insect epidemics, exotic species invasions, and alterations in wildlife habitat. Scientists are exploring a suite of climate change scenarios to develop high-resolution monthly drought metrics over the 21st century.

Monitoring and modeling climate change effects on Northwest estuarine habitats

Scientists are working with Tribes, watershed alliances, NGOs, federal agencies and academic institutions to investigate process-based modeling of estuarine environments. We are examining habitat suitability, connectivity, threats, and resilience for a range of ecologically, culturally, and commercially important taxa of fish, plants and wildlife. These efforts build on partner-driven, interdisciplinary, science needs related to the effects of retreating glaciers, and quantify and define atmospheric, terrestrial and marine processes influencing water quality and coastal ecosystem function.

Information Synthesis and Other Technical Support

Adapting to climate change on federal lands in Washington State

A strategic plan for adaptation to climate change across millions of acres of national forest and national park lands in Washington will help managers who seek resource sustainability under a warmer climate. Scientists and managers are working together to synthesize scientific information, develop inferences at large spatial scales, develop and test collaborative processes, and integrate scientific activities with specific planning applications.

Assessing needs for information and services in support of ecological studies and climate change adaptation at the landscape scale

Scientists are assembling an up-to-date catalogue of relevant Northwest climate change research and a comprehensive guide to current and ongoing research activities of the consortium of entities across the region participating in the NW CSC.

Forecasting Climate Change

Superensemble of regional climate simulations

Scientists are using a sophisticated numerical prediction method linking a collection of climate, hydrological, and land cover models into a superensemble to produce climate change scenarios and forecasts relevant to the Pacific Northwest. This regional experiment provides detailed answers to key questions about those aspects of climate change that matter most to the environment, such as frost days, heat waves, and consecutive dry days.

Expected Climate Impacts:

- Increasing average annual temperatures
- Precipitation increasing in winter and decreasing in summer
- Declining snow pack
- Reduced summer streamflows
- Increased risk of forest fires and insect outbreaks
- Erosion and loss of land on coasts due to sea-level rising

The Northwest Climate Science Center (NW CSC) was established in 2010 by the U.S. Department of the Interior (DOI) to address the challenges presented by climate change and variability in the northern United States. The center is a federally led research collaboration hosted by three major universities and brings together the expertise of federal and university scientists to address climate change priority needs of federal, state, and tribal resource managers. Its purpose is to provide scientific information, tools, and techniques that managers and other parties interested in land, water, wildlife and cultural resources can use to anticipate, monitor, and adapt to climate change.

Authors: Sarah Badkin and Carol Schuler
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Examples of NW CSC Research and Technical Assistance

Vulnerability Assessments
Carbon sequestration and rangeland management

Scientists are investigating the possibility that changes in rangeland management could represent an opportunity to mitigate greenhouse gas emissions and also improve the sustainability of rangelands. Particular attention is given to the benefits and costs of alternative practices for rangeland management that could sequester carbon in rangeland soils.

Vulnerability of Great Basin wetlands, migratory birds, and their prey

Scientists are examining large-scale effects of climate variability on wetlands and wetland-dependent species in the Great Basin. Using remote sensing, molecular genetics, and environmental modeling, we are evaluating relationships between climate, water supplies, and prey species in order to predict a variety of changes, including the persistence of migratory waterbirds.

Quantifying vulnerability of quaking aspen woodlands and bird communities in the Northern Great Basin

Scientists are studying how climate change and management strategies will likely affect quaking aspen populations and associated bird communities in the Northern Great Basin. We are combining information about bird-habitat relationships with models of aspen community and disturbance interactions under various climate scenarios.

Aquatic ecosystems and landscape processes in the face of climate change

In partnership with the U.S. Forest Service, scientists are studying how fish and other biota respond to increases in stream temperatures in the Pacific Northwest. The research includes a retrospective analysis of water temperature changes and investigations of the actual processes that cause water to heat or cool in natural settings.

Coastal vulnerability to sea-level rise and climate change

Scientists, working closely with Northwest Coastal Tribal Nations, British Columbia First Nations, the Pacific Northwest Climate Change Collaboration (C3), other CSCs, and the NPLCC, are developing collaborative processes, and integrate scientific activities with specific planning applications.

Assessing needs for information and services in support of ecological studies and climate change adaptation at the landscape scale

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Northwest Climate Science Center
Conducting and Delivering Fundamental Climate Impact Science to Northwest Resource Managers
U.S. Geological Survey / U.S. Department of the Interior in collaboration with Oregon State University, University of Idaho, and University of Washington

The NW CSC generally encompasses a geographic area that includes Washington, Oregon, Idaho, and western Montana. This region harbors a rich diversity of natural systems, including marine and freshwater habitats, forests, sage-steppe, high-altitude deserts, wetlands, and grasslands. Climate change, one of the greatest environmental and conservation challenges of the 21st century, is predicted to alter temperature and precipitation, which could negatively affect both natural and developed areas. Impacts related to changes in snowpack, streamflows, sea level, wildfire, invasive species, extreme weather effects, and other important aspects of life in the Northwest already are occurring, with severe effects expected over coming decades in response to continued and accelerated changes. The future prosperity of both human and natural systems will depend on progressive, reliable, and readily available information about climate change effects.
The National Climate Change and Wildlife Science Center was established by Congress in 2008 to deliver scientific and technical information to help fish and wildlife managers, including those managing habitat, cope with a changing climate. This center is managed by a small staff located at the U.S. Geological Survey headquarters in Reston, Virginia. The center fosters national partnerships and identifies national or multi-regional science needs.

In 2009, DOI Secretarial Order No. 3289 expanded the scope and geographic reach of climate science by initiating the establishment of eight regional DOI-managed Climate Science Centers (CSCs) and 21 Landscape Conservation Cooperatives (LCCs). CSCs and LCCs have collaborative and complementary roles. LCCs, through geographic partnerships, will help define and prioritize science needed to address conservation and management issues. CSCs will respond to some of these needs by delivering basic climate science to LCCs, including physical and biological research, ecological forecasting, and multi-scale modeling. LCCs will use this applied scientific information about climate change and other major stressors to support coordinated landscape-scale conservation and adaptive management.

The NW CSC will primarily focus on three LCCs whose boundaries overlap with the CSC; the Great Northern (GNLCC), Great Basin (GBLCC), and North Pacific (NPLCC) LCCs. It is important for the NW CSC to collaborate with these three LCCs to ensure the highest priority needs are met, redundancies eliminated, and that significant opportunities exist across boundaries for sharing of resources and communicating climate science information to land, water, and cultural resource managers, and the public at large.

### Priority Science Activities of CSCs

- Create and use high resolution climate modeling to support adaptation planning for natural and cultural resources
- Integrate physical climate models with ecological, habitat, and population response models
- Assess the vulnerability and risk of natural and cultural resources to climate change
- Forecast changes in natural and cultural resources in response to climate change
- Develop standardized approaches to modeling and monitoring