

11. Research and Monitoring



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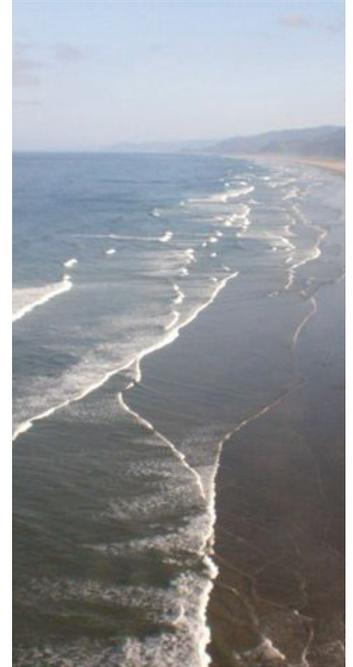
In the Pacific Northwest, a wide body of research exists on the impacts of climate change. The Climate Impacts Group (CIG) at the University of Washington has taken several steps to improve science/policy interactions through multiple methods and interdisciplinary approaches. In 2009, CIG completed a comprehensive assessment on the impacts of climate change on Washington and the implications for nine key economic sectors in the state. CIG also worked with several water management agencies in Washington to determine the effects of climate change on water resources, including development of hydrologic climate scenarios for nearly 300 streamflow locations in the Columbia River Basin and selected coastal drainages in western Washington.

Over the past few years, universities, regional organizations, federal and state agencies, local communities, tribes, and nongovernmental organizations formed several new partnerships. These collaborations are working to improve regional climate science projections, expand and coordinate scientific research and monitoring, and provide best available information to policymakers, managers, and the public.

State agencies need to be involved with various regional research organizations to ensure that scientific research agendas developed by the organizations can apply toward reducing Washington State's vulnerability to climate change and climatic extremes. Identifying the need for additional research and scientific information involves interactions with local experts, decision makers, and other groups, such as water users and managers, forest fire managers, and the conservation community.

Support is needed for additional research and monitoring to expand our understanding of the impacts of climate change; develop tools to ensure that climate information is accessible, relevant, and useful for decision makers and resource managers; and allow managers to track how climate change is progressing and how natural and human systems are responding. Tools that effectively incorporate past and future climate changes into land and water management are critical to making good decisions affecting natural and built systems. Also, new and improved partnerships are needed to tailor scientific information to local decision-making needs.

Improving our capacity to respond to climate change may require new monitoring networks or the expansion or adjustment of existing monitoring systems. Monitoring information can be used to refine and test the models and assumptions we use for projecting future climate changes. Monitoring networks that agencies and others currently manage are typically not well-coordinated and integrated, nor are they adequately funded to clearly focus on climate change and climate variability. Better integration is needed to ensure that monitoring data are easily accessible and can be shared.



Recommended Strategies and Actions— Research and Monitoring

Strategy H-1. Improve scientific knowledge and ensure that climate science is responsive and applied to the needs of policymakers, managers, planners, and others.

Actions:

1. Solicit input from local governments, tribes, businesses, nongovernmental organizations, and other stakeholders to identify needs for data, information, and resources that would foster their understanding of the risks and consequences of climate change at the regional, state, and local levels.
2. Participate in current research efforts conducted by the UW Climate Impacts Group, Northwest Climate Science Center, Regional Integrated Science and Assessment Center - Climate Impacts Research Consortium (CIRC), the North Pacific and Great Northern Landscape Conservation Cooperatives, and others to ensure the scientific research agenda recognizes Washington's distinctive natural resources and addresses priority needs of the state.
3. Support the periodic update of the U.S. National Climate Assessment for the Northwest and CIG's comprehensive regional climate scenarios for Washington State.

Understanding Washington's marine waters

The Puget Sound Assessment and Monitoring Program is an extensive network of regional scientists who monitor key indicators of water and sediment quality, nearshore habitat, and the health or abundance of fish, seabirds, shellfish, and marine mammals. With more than 25 years of water quality monitoring—including temperature, pH, and sediment—we are in a unique position to assess status and trends in our waters. This long-term monitoring lets us know if our waters are healthy or impaired and tracks trends over time.

Ecology's Marine Monitoring Unit conducts a variety of marine observations, including monthly sampling at 40 core monitoring stations. Ecology uses a floatplane to take photos of Puget Sound water conditions during routine transit flights between the Kenmore base and Olympia.

"Eyes Over Puget Sound" is the result, and the effort provides an example of how we are optimizing our resources to monitor Puget Sound. "Eyes Over Puget Sound" combines high-resolution photo observations with satellite images, data collected en route on ferries traveling across Puget Sound and to Vancouver Island, and measurements from moored instruments.

For more information:

www.ecy.wa.gov/programs/eap/mar_wat/mwm_intr.html

www.ecy.wa.gov/programs/eap/mar_wat/eops/

Strategy H-2. Partner and collaborate with state, federal, tribal, and local governments and various organizations to enhance existing monitoring systems, and develop new systems where needed to monitor the impacts of climate change and the efficacy of adaptation responses.

Actions:

1. Establish an extensive network of sentinel site monitoring stations at locations that are not expected to be subject to local land use changes. Include continuous monitors that track multiple measures, such as temperature, water quality and stream flows, at sentinel sites and at selected long-term ambient monitoring sites.
2. Take measurements in and around streams to:
 - *Assess hydrologic effects to stream channels from extreme storm events, including measuring the geometry and sediment composition of stream channels.*
 - *Assess biological integrity with regard to climate change impacts, such as monitoring of sediment-tolerant/intolerant organisms (taxa) and heat-tolerant/intolerant organisms.*
 - *Assess the stresses to riparian vegetation from dropping water tables and changing temperatures.*
 - *Evaluate signals in hydrology such as those developed by The Nature Conservancy through the Indicators of Hydrologic Alteration (IHA) software.¹⁶⁴*
3. Work with the U.S. Geological Survey to implement a robust, multi-purpose groundwater monitoring program in Washington State, which will be part of the national groundwater climate response network (CRN).¹⁶⁵
4. Implement monitoring programs designed specifically to test the effectiveness of adaptation actions and the assumptions underlying proposed adaptation actions. Encourage each agency or partner to monitor the implementation of its respective actions.
5. Collaborate with various agencies to monitor the spread of pests and diseases and to increase the overall efficiency and sensitivity of current surveillance systems.



Sentinel sites are monitoring stations for which long-term monitoring data are available.

¹⁶⁴ See <http://conserveonline.org/workspaces/iha>.

¹⁶⁵ See <http://pubs.usgs.gov/fs/2007/3003/pdf/2007-3003-lowres.pdf>.

Strategy H-3. Support development and use of applied tools for decision makers and land and water managers to help them understand the risks and consequences of changing climatic conditions on communities, infrastructure, and natural systems; and select effective adaptation options to build resilience.

Actions:

1. Share existing tools with local governments, state and tribal agencies, and local communities to help them understand key vulnerabilities to climate impacts and what actions can be taken. Examples include the Climate Ready Water Utilities Toolbox, Georgetown Climate Center sea level rise tool, and other tools. Incorporate climate change considerations into existing planning tools that evaluate the effects of alternative land use policies, such as ENVISION, INVEST, and models from the Natural Capital Project.¹⁶⁶
2. Maintain the state's climate adaptation clearinghouse and link to other clearinghouses to improve the availability of information.¹⁶⁷ Leverage and link existing efforts to support climate adaptation efforts at the state, tribe, and local levels.

Climate Adaptation Clearinghouse

The Washington Department of Ecology's climate adaptation clearinghouse contains links to information on the impacts of climate change, regional and federal adaptation efforts, and resources to help communities plan and adapt.

www.ecy.wa.gov/climatechange/ipa_resources.htm



¹⁶⁶ See www.naturalcapitalproject.org

¹⁶⁷ See www.ecy.wa.gov/climatechange/ipa_resources.htm