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# Choices & Change

## Preparing for climate impacts

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*Climate Science in the  
Public Interest*

*October 27, 2005*

*The Future Ain't What It Used to Be: Preparing for Climate Disruption*

## What have we learned?

- Climate is changing
- Changes in snowpack and streamflow caused by rising temperatures will have important consequences for resources across the Pacific Northwest
- These changes are likely to be most acute during the summer, exacerbating existing conflicts



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- Climate is changing
  - Rising snow lines, a declining snowpack, streamflow increases in winter, and declines in summer are always observed during an unusually warm Northwest winter and spring. Our present climatic course promises to transform the "unusual" of our experience to the "normal" of our future.
- Changes in snowpack and streamflow are important
  - All sectors are united in their dependence on water – and they will all be affected by future changes in the amount and timing of available water.
- Changes will exacerbate summer conflicts
  - We already experience conflicts over scarce water resources during low streamflow conditions in the summer. Climate change, projected to further decrease summer low flows and increase the frequency of droughts, would just make these conflicts worse.

Climate change will force resource managers and planners to deal with increasingly complex trade-offs between different management objectives.



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In many cases in water resources management, for example, any change that would improve the system's ability to fulfill one sector's water needs in a warmer climate would inherently require trade-offs from other sectors.

Remember this in breakout sessions that are focused on individual sectors – these trade-offs and interactions will be increasingly important in a warmer climate.

## Choices and change

- Climate changes projected for the next few decades are largely unavoidable
- Today's choices will shape tomorrow's impacts
- Planning should begin now

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- Climate changes projected for the next few decades are largely unavoidable
- Two kinds of choices that we make today will shape tomorrow's impacts
  1. Choices about whether and how to prepare for projected impacts (near- and long-term regional consequences of global climate change)

The ultimate local consequences of global climate change will depend in a large part on decisions we make now. All kinds of decisions made every day— about economic development opportunities, resource management, or habitat restoration, for example – will affect our future vulnerability to climate change. It's important that we make these choices with an open eye towards the future.
  2. Emission choices (ultimate magnitude of global climate change)
- Planning should begin now

It takes time to plan and implement changes in infrastructure, such as energy and large-scale water supply systems. It takes time to change management policies and institutional directives and responsibilities.

If we wait until the last minute to formulate adaptation strategies, we risk being ill equipped to exploit the benefits of a changed climate or to cope with its associated costs.

# How do we plan for these changes?

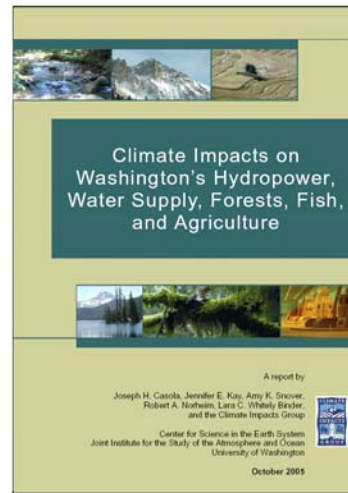


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## Guiding Principles for Planning

- Familiarize yourself with climate impacts



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### FAMILIARIZE SELF With CLIMATE IMPACTS

Identify how the things/resources you care about/manage will be affected by climate change. Identify ways that climate change will affect your management objectives. What does climate change mean for salmon returns? For apple production? For preventing urban floods?

-Nathan Mantua's plenary talk provided a broad overview

-Breakout groups will go into more detail about what the future might look like to people in the various sectors

-The white paper provided for the conference ("Climate impacts on Washington's hydropower, water supply, forests, fish and agriculture") provides more detail and includes an extensive list of references for even more information. Available at: <http://www.cses.washington.edu/db/pdf/kc05whitepaper459.pdf>

## Guiding Principles for Planning

- Familiarize yourself with climate impacts
- Recognize that the past may no longer be a reliable guide to the future



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### PAST NO LONGER A RELIABLE GUIDE TO THE FUTURE

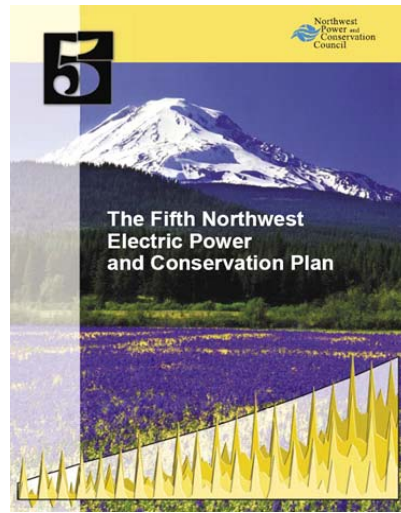
“The Future Ain’t What It Used to Be” is the apropos title of this conference.

Future climate is likely to be different from that of the past. Important to plan explicitly for that warmer future rather than basing management decisions solely on historical climate.

Just as modern flood-plain mapping accounts for the changes in streamflow likely to result from future development – or build-out – of a watershed, it should account for the changes in streamflow likely to result from changes in climate.

## Guiding Principles for Planning

- Familiarize yourself with climate impacts
- Recognize that the past may no longer be a reliable guide to the future
- Integrate climate change projections into planning processes



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### INTEGRATE CLIMATE CHANGE PROJECTIONS INTO PLANNING

We regularly make decisions that involve expectations and assumptions about the future. It's important to include information about how regional climate and natural resources are projected to change, to ensure that management approaches will still be successful at meeting their objectives under changed conditions.

Simple example: consider habitat conservation plans concerning coastal wetlands. Without consideration of how projected sea level rise could inundate coastal wetlands, conservation dollars could be spent acquiring coastal habitat that would only be swallowed by rising seas a few decades later.

I'm sure each of you could name a handful of planning activities relevant to your sector for which the climate change information we heard this morning would be important. E.g., Watershed Planning Program (EHSB 2514), Salmon recovery (ESHB 2496), Water supply planning, Local land use planning, Flood control planning, Forest management plans, Nearshore and coastal planning, Water quality management.

Example shown here, the Northwest Power and Conservation Council's 5<sup>th</sup> Power Plan includes an analysis (in Appendix N) of the implications of a changing climate for Columbia River hydropower generation and regional electricity demand (shown in Mantua's plenary presentation).

## Guiding Principles for Planning

- Take actions to maintain or increase the resilience of regional ecosystems



Log weirs placed in a small coastal Washington stream to create pools and habitat for coho salmon. NWFSC.

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### INCREASE RESILIENCE OF ECOSYSTEMS

The fact that it is impossible to project exactly what climate change means for a certain species of shellfish or a certain pollinator means that it will be very difficult, if not impossible, to engineer resource management to match anticipated climate conditions. It may be more effective to maintain the ecosystem's capacity to adapt to future changes as they come.

## Guiding Principles for Planning

- Take actions to maintain or increase the resilience of regional ecosystems
- Monitor regional climate and resources for ongoing change



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### MONITOR CLIMATE AND RESOURCES

Effective management and planning requires putting systems in place to monitor regional climate, ecosystems, and natural resources for ongoing changes. The effects of climate change may initially be subtle and difficult to disentangle from the changes wrought by humans and by natural climate variations, but without monitoring and accounting for these changes we will fail to understand the root causes of changes occurring in the region or the ways in which current conditions differ from those experienced in the past.

Crucial part of responding to and learning from changes.

## Guiding Principles for Planning

- Take actions to maintain or increase the resilience of regional ecosystems
- Monitor regional climate and resources for ongoing change
- Design for surprises. Policies & management practices should be flexible.



Picasso – The Acrobat (1930)

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### DESIGN FOR SURPRISES. BUILD IN FLEXIBILITY

Projections of future climate changes and impacts will continue to be refined over time. We will never be able to predict the specific consequences of climate change on complex ecosystems like the Puget Sound with the specificity some would desire. As a result, it is essential to expect surprises and design for flexibility to changing conditions. We should design contingency planning into management guidelines to ensure that ongoing adaptation to unexpected (or uncertain) conditions can occur without requiring additional policy intervention.

Allow wiggle room.

## Managing Climate Risk

- Think of preparing for climate change as an exercise in risk management
- Develop a climate insurance portfolio



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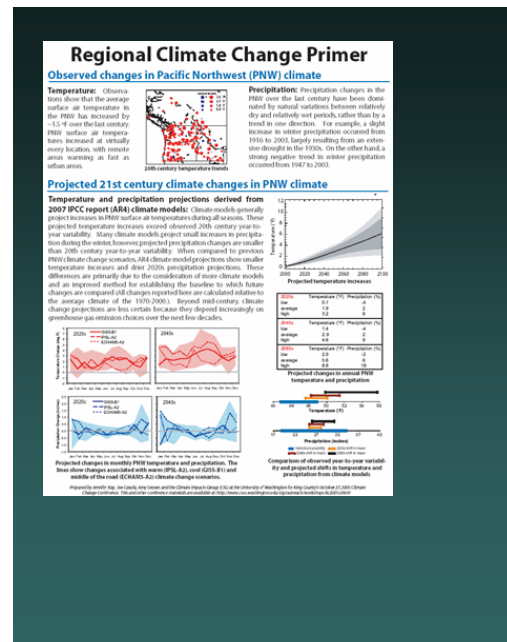


Projected regional climate change shows a risk of substantial changes to the physical and biological environments of Washington state and prudent resource management will prepare for these risks. assess the outcomes associated with different resource management activities under various climate change scenarios to prioritize adaptive strategies. When relatively little is at stake, use a conservative or best-case climate change scenario. When more is at stake, or when climate change is likely to have irreversible ecosystem consequences, consider a mid-range or worst-case scenario.

Hedge your bets. Manage your exposure to risk.

# Materials to help you plan

- Regional climate change primer



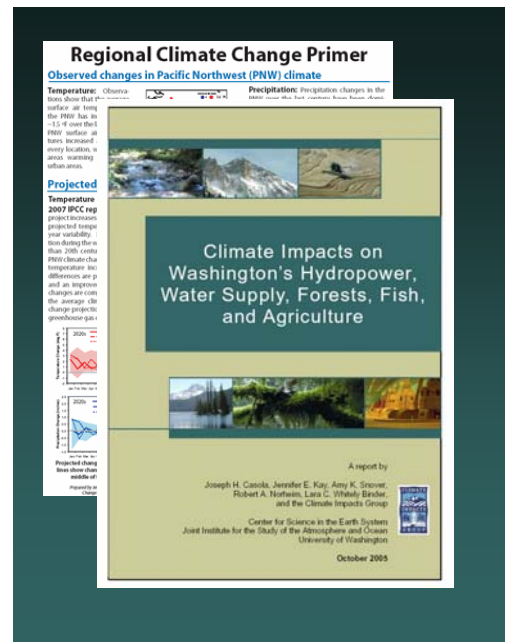
The Regional Climate Change Primer, a one-page summary of projected regional climate change is available at <http://www.cses.washington.edu/db/pdf/kc05regionalcc464.pdf>.

Also available:

- Global Climate Change Primer: A one-page summary of projected global climate change. (<http://www.cses.washington.edu/db/pdf/kc05globalcc463.pdf>)
- Climate Change Policy Primer: A primer on important happenings in climate change policy at the international, federal, regional, and local levels. (<http://www.cses.washington.edu/db/pdf/kc05ccpolicy465.pdf>)
- Regional Climate Change Science Primer: A primer describing how regional impacts of global change are determined. (<http://www.cses.washington.edu/db/pdf/kc05regccscience466.pdf>)

## Materials to help you plan

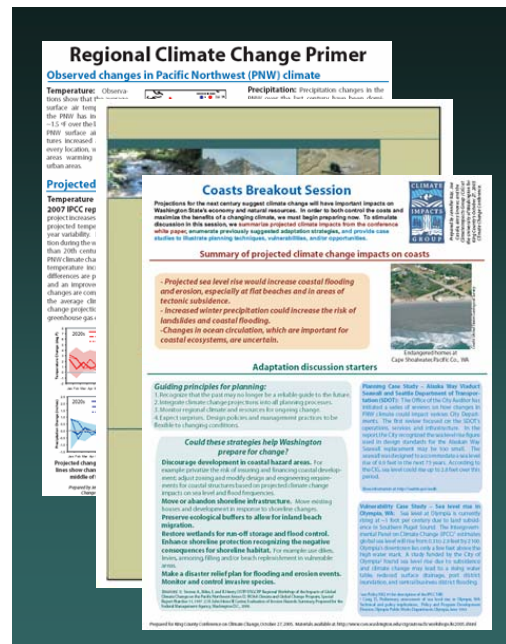
- Regional climate change primer
- Report: regional climate change and impacts



The white paper provided for the conference (“Climate impacts on Washington’s hydropower, water supply, forests, fish and agriculture”) provides detailed information about projected climate change and likely impacts on Washington state and includes an extensive list of references for even more information. Available at: <http://www.cses.washington.edu/db/pdf/kc05whitepaper459.pdf>.

# Materials to help you plan

- Regional climate change primer
- Report: regional climate change and impacts
- Sector-specific adaptation strategies

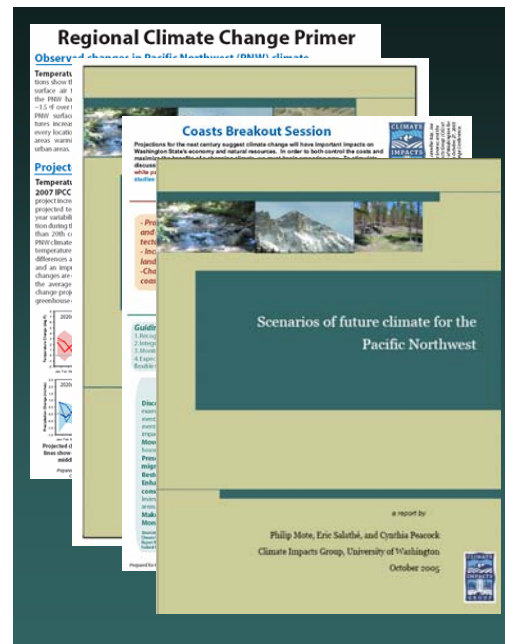


The Climate Impacts Group also prepared one-page handouts for each sector summarizing projected climate change impacts and potential strategies for preparing for these impacts. The preparation/adaptation strategies were culled from a variety of sources (other conferences/workshops/publications/reports) and are meant to stimulate discussion as to which strategies will be appropriate here in Washington.

The fact sheets are available (as a package containing fact sheets on Hydropower, Municipal and industrial water, Stormwater management and floods, Fish, Forests, Agriculture, Coasts) at:  
<http://www.cses.washington.edu/db/pdf/kc05sectorsumall475.pdf>.

## Materials to help you plan

- Regional climate change primer
- Report: regional climate change and impacts
- Sector-specific adaptation strategies
- Climate change scenarios for use in planning studies
- ...



A report detailing the most recent climate change scenarios (prepared for the 2007 (Fourth) Intergovernmental Panel on Climate Change Assessment) downscaled to the Pacific Northwest, "Scenarios of future climate for the Pacific Northwest", is available at <http://www.cses.washington.edu/db/pdf/kc05scenarios462.pdf>.

## Leaders in Preparing for Change

- California: Governor Schwarzenegger Executive Order S-3-05
- Northwest Power and Conservation Council
- Northwest Fisheries Science Center
- Seattle Public Utilities
- Portland Water Bureau
- US Bureau of Reclamation
- City of Olympia
- Seattle City Auditor



"That the Secretary [of the California Environmental Protection Agency] shall also report to the Governor and the State Legislature by January 2006 and biannually thereafter on the impacts to California of global warming, including impacts to water supply, public health, agriculture, the coastline, and forestry, and shall prepare and report on mitigation and adaptation plans to combat these impacts..."  
- Executive Order S-3-05, June 2005

Schwarzenegger: "the debate is ohvah." Exec order focused mostly on mitigation, but did call state agencies to look at adaptation and provide a biennial report on likely impacts and the state's preparation for them.

NWPPC: 5<sup>th</sup> power plan – impacts of 4 climate change scenarios on hydropower generation and electricity demand

NWFSC: looking at how climate change (and land use change) affects Snohomish flow and its implication for salmon recovery planning

SPU: forefront of Washington municipal water utilities. Commissioned study on climate change impacts on the snowpack and streamflow that Seattle depends on for drinking water, as well as on how well the system could cope with these changes.

Portland: similar.

US Bureau of Reclamation: study of climate change impacts in the Flathead river basin looking at impacts on flood control and recreation on Flathead Lake

City of Olympia: 1993 study of sea level rise impacts on downtown Olympia

Seattle City Auditor: 2005 study of the vulnerability of Seattle Department of Transportation's operations to climate change. (Available at: [http://www.seattle.gov/audit/report\\_files/2005-12\\_Climate\\_Change\\_Report.pdf](http://www.seattle.gov/audit/report_files/2005-12_Climate_Change_Report.pdf))

By starting now to plan for a changing climate, we can build the ecological, political and socioeconomic capacity required to cope with climate change in Washington state.



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Let's get to it.