Fish and Shellfish Breakout Session

Projections for the next century suggest climate change will have important impacts on Washington State's economy and natural resources. In order to both control the costs and maximize the benefits of a changing climate, we must begin preparing now. To stimulate discussion in this session, we summarize projected climate impacts from the conference white paper, enumerate previously suggested adaptation strategies, and provide case studies to illustrate planning techniques, vulnerabilities, and/or opportunities.

Prepared by Jennifer Kay, Joe Casola, Amy Snover, and the Climate Impacts Group (CIG) at the University of Washington for King County's October 27, 2005 Climate Change Conference.

Summary of projected climate change impacts on fish and shellfish

Changes in the annual patterns of streamflow. For snowmelt-dominant and transient basins, projected climate change would increase winter flow and shift peak flows to earlier in the spring. These changes could be detrimental to salmon rearing, migration and spawning by increasing scouring events, reducing the freshet, and increasing incidences of low summer flows.

Increased water temperatures. Increased summer in-stream temperatures may exceed tolerable limits for coldwater fish populations.

Increased water stratification. Increased stratification in lakes, Puget Sound, and the coastal ocean could decrease nutrient availability.

Future changes in coastal and marine habitat are uncertain.

Credit: Mercer Island Parks

Salmon in Lake Washington

Adaptation discussion starters

Guiding principles for planning:

1. Recognize that the past may no longer be a reliable guide to the future.
2. Integrate climate change projections into all planning processes.
3. Monitor regional climate and resources for ongoing change.
4. Expect surprises. Design policies and management practices to be flexible to changing conditions.

Could these strategies help Washington prepare for change?

Evaluate climate change impacts through entire fish life cycles and manage accordingly.

Integrate climate change information into salmon recovery planning. The sensitivity of salmon vitality to climate change depends on basin-specific cumulative impacts of land and water use.

Improve water quality by reducing pollution. For example: reduce stormwater runoff, which transports pollution to water bodies.

Maintain biodiversity and protect diverse fish habitats. Genetic, life history, and behavioral diversity decreases sensitivity of species to a changing environment.

Find ways to minimize elevated water temperatures and low streamflow in the summer. Reduce removal of riparian vegetation and secure strict in-stream flow requirements.

Consider creative engineering solutions that will aid fish migration and improve fish environments.

Sources: 1) Snover, A., Miles, E. and B. Henry, OSTP/USGCRP Regional Workshop of the Impacts of Global Climate Change on the Pacific Northwest Annex D, NOAA USGCRP , Special Report Number 11, 1997. 2) Mantua, N. and R. Francis – Natural climate insurance for Pacific Northwest salmon and salmon fisheries: Finding our way through the entangled bank. American Fisheries Society Symposium, 43, 2004. 3) Glick, P., Fish out of water: A guide to global warming and Pacific Northwest rivers, National Wildlife Federation, March 2005.

Planning case study - Snohomish Utility Salmon Habitats Improvement (SUSHI): The Northwest Fisheries Science Center (NWFSC) is collaborating with the CIG[3] to explore the impacts of climate change on salmon recovery plan alternatives in the Snohomish River Basin. By inputting climate change scenarios into a salmon life cycle model, researchers are linking habitat changes to fish population dynamics in a changing climate. Comparing results from a range of management options will allow NWFSC to choose the recovery plan projected to have the best influence on salmon survival.

[3]see http://www.tag.washington.edu/projects/sushi.html

Vulnerability case study - Salmon in the Columbia River Basin (CRB): Using existing CRB infrastructure, Martin[1] developed a plan that could accommodate both flood control and in-stream flow interests in a warmer world. With Martin's plan, water would be held in the winter and released in the spring to simulate historic flows important for juvenile salmon migration. Thus, both natural river flows and protection from the risk of uncontrolled flooding would be achieved. However, managing for fish, flood control, *and hydropower* in a warmer world could be more challenging. A recent study[2] concludes earlier reservoir refill and greater storage allocations for summer in-stream flow targets could mitigate some of the negative impacts of climate change on CRB salmon, but only with significant losses in firm hydropower (up to -35%). If increased temperatures increase summer electricity demand, however, there may be some synergy between releasing water for hydropower generation and in-stream flows in the summer.

[1]Martin, K., Altered Flood Control, Climate Change, And Rebuilding Pacific Northwest Salmon Stocks, Columbia River Inter-tribal Fish Commission Technical Report, Winter 2004. http://www.critfc.org/text/nat_riv.html

[2]Payne, J. T., Wood, A. W., Hamlet, A. F., Palmer, R. N., and Dennis P. Lettenmaier, Mitigating the effects of climate change on the water resources of the Columbia River Basin, Climatic Change, 62, 233-256, 2004.

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