Climate Impacts on Salmon Management and Recovery in the Columbia River Basin: Summary of Afternoon Discussion Sessions

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Summary Notes for the Afternoon Sessions

Climate Impacts on Salmon Management and Recovery in the Columbia River Basin
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On Tuesday, September 21, 2004, the University of Washington's Climate Impacts Group hosted a one day meeting on the impacts of climate variability and change on salmon management and recovery in the Columbia River Basin. The meeting brought a diverse range of representatives from

- federal, regional, state, tribal, and local resource management agencies,
- academic and federal research groups,
- non-profit groups,
- public/private utilities, and
- consulting agencies

together for a day of presentations and discussions. The following is a summary of the panel discussion (1:45-3:00) and audience discussions on the Mantua and Francis 2004 paper (3:15-4:20) and research and outreach needs (4:20-4:50). More information on the meeting, including presentations, is available at http://www.cses.washington.edu/cig/outreach/workshopfiles/portland2004salmon/index.shtml.

Panel Discussion: What Does Climate Variability and Change Mean for Short-term and Long-term Salmon Management Objectives (1:45-3:00)

Moderator: Prof. Ed Miles, University of Washington Climate Impacts Group
Panelists: Tom Cooney, Co-Chair, Interior Columbia Basin Technical Recovery Team, National Marine Fisheries Service
Scott Marshall, Staff Biologist, Idaho Department of Fish and Game
Mike Matylewich, Manager, Fisheries Management Department, Columbia River Intertribal Fish Commission
Bill Tweit, Columbia River Policy Coordinator, Washington Department of Fish and Wildlife
David Ward, Program Manager, Columbia River Coordination Program, Oregon Department of Fish and Wildlife

Purpose and Structure of the Panel Discussion

The purpose of the panel discussion was to bring five representatives from federal, state, and tribal fish management agencies together for a focused discussion on how climate variability and change may affect short-term and long-term salmon management objectives. The panel discussion was scheduled for 1:45-3:00. Prior to the panel discussion were several presentations on the Pacific Northwest (PNW) climate variability and change and projected impacts on PNW salmon, including two case studies looking at the application of climate information on Snake River spring/summer chinook. Panelists were asked to reflect on the day's presentations and consider the following questions:

- What have we learned about climate impacts based on the day's discussions and the case studies?

- What does climate variability and change mean for short-term harvest, allocation, and hatchery production and operations decisions?

- What does climate variability and climate change mean for long-term salmon recovery planning?

- Do the current management techniques and procedures we rely on to buffer salmon populations against seasonal to interannual climate variability actually increase vulnerability to decadal scale climate variability and change by reducing adaptability?

- How can climate information be better integrated into short-term and long-term management strategies and decision-making processes?

- What advice do the panelists have for the way forward?

Prof. Miles invited the panelists to focus on the first three questions collectively before answering the last three. The questions were used to structure the general discussion but were not used to constrain the discussion; the panel was allowed to introduce new concepts or questions as they saw appropriate. The following is a summary of the panel discussion.

Discussion Summary

Bill Tweit, who sat closest to the moderator, was the first to respond to Prof. Miles's request that the first three questions be addressed.

Bill Tweit. Bill represents the Director of the Washington Department of Fish and Wildlife in harvest decisions for Columbia River fisheries in the short term ("tomorrow") and the long term, which Bill defined (somewhat humorously) as "next week". Bill recognized that we are in a good period right now and noted that the 1990s were sobering. The decade was bad not just for the resources but also for recreational, commercial, and tribal fishermen. It is sobering to think the region could return to those conditions. We know that climate variability can deal another 1990s and are developing an understanding that climate change may deal recurrent bad periods or more severe periods. Risk-averse policies mean decisions are made before the season begins. Making in-season adjustments is very difficult.

Scott Marshall. Scott began by noting that he was in Alaska for an extended period (during the boom times) prior to moving to Idaho. Scott noted that in southwest Alaska, extensive pink salmon resource data shows that escapement is directly related to the environment, not state activities. This finding, in Scott's opinion, is sobering. In Idaho, Scott is asking himself how long until bad times return again, how deep will it go, and will freshwater conditions be strong enough to sustain the bad times? From a historical perspective, spring/summer chinook have been able to sustain themselves over thousands of years but there are lots of anthropogenic effects in the spawning areas. A big change in Idaho has been understanding smolt-to-adult survival rates and trying to tease out where we can make gains in specific stages. It is important to understand what we can do to get smolts downstream and how climate affects that.

Tom Cooney. Tom recapped some of the main points he had taken from the morning's presentations. These were:

1. Year-to-year ocean/climate variability plays an important role in patterns we have seen. The question becomes what can we do about other factors to ensure the ability to survive?
2. No one factor predicts survival in the ocean. Regression can fool you into thinking you understand something – but this seems robust. It is becoming clear that sets of factors matter.
3. The morning brought home the influence of PDO on survival but there is a lot of variation within that. It is rare to get more than three to four good years (a big message for recovery). In the 1990s we saw 10+ bad years in a row. How high do we need to raise productivity to weather the next downturn?
4. The last two talks moved the audience along on how to consider uncertainty. Research is moving away from average values to handle more variation. We need more risk analysis. What are the trade offs? We need more work on how to express the results of risk assessment tools.

Mike Matylewich. Mike noted that his organization [Columbia River Intertribal Fish Commission (CRITFC)] takes a very long range view. Points Mike took from the morning's presentations included the following:

1. We need to be cognizant of big effects and take account of ocean and climate variability.
2. Time and geographic scales are important. How have other regions' stocks responded?
3. We use sibling regressions for harvest decisions, but those don't pick up all the variations. We need to think about what happens in the oceans when the jacks have come in but the adults are still out there. The region has moved away from fixed targets and has gone to more proportional allowances (stepped rates) in an effort not to harvest all fish above the escapement rate.

Mike also noted that CRITFC has been trying to incorporate new information. A concern is trying to manager at smaller scales while the understanding lies at the larger scale. Forecasts for snowpack indicate that we have serious problems. If these forecasts are in true, then we are in trouble. Over-allocation is a huge issue in the Columbia River Basin. Mike is interested in looking at long-term predictions of hydrologic change – serious problems that can't be fixed just by limiting harvest.

David Ward. David began by noting that he firmly believed that the onus should not all be on harvest management; harvest management is just one tool. Other tools include water management, hydropower operations, and water withdrawal. All of these tools have to take climate into effect. Bad climate for salmon also tends to be bad for hydropower and the salmon generally lose out in these cases. Longer-term planning all around would be good.

Audience comment/question. An audience member asked if the same intellectual horse power is being spent on climate effects on a sub-basin level? I thought that Alan's work has an overall averaging effect. The same analysis in the Deschutes, for example, might show a much more dramatic effect.

Alan Hamlet (UW Climate Impacts Group): The Climate Impacts Group (CIG) has a number of partnerships ongoing on this issue, including the Northwest Power and Conservation Council and the Idaho Department of Water Resources (IDWR). The IDWR is integrating climate information in their water management model. The sub-basin impacts are important considerations. Dworshak, on the North Fork of the Clearwater, is very sensitive to climate while places in the upper Snake basin are not so sensitive.

Bill T. Bill added that timing of flows and withdrawals is important. We need to start talking about the fact that it isn't just climate change but also a highly altered ecosystem that has to be taken into account.

Nate Mantua (UW Climate Impacts Group). Nate noted that we have altered flows through dams more than climate change will. Have we boxed ourselves in or are there opportunities to mitigate for climate change with the dams? (a question for the panelists)

Mike M. In response to Nate's question, Mike commented that water availability is more critical on a sub-basin scale. There may be more flexibility on the mainstem. Therefore, the answer is a question of scale.

Tom C. Scale is an issue. There is probably more flexibility to increase productivity for some populations. Fall chinook are probably very vulnerable – can we get them back into their historic range? There is not a lot of room in sub-basins. Similarly, there is not a lot of flexibility even on the mainstem to deal with a series of dry years. Mainstem flexibility is probably population specific. Restoring flow and removing dams is not a panacea.

Bill T. A major question is what electric demand is going to look like? Consider the energy crisis/drought in winter 2001. The way the power market dominated things in 2001 may be more likely in the future, meaning lost flexibility.

Bob Francis (UW Climate Impacts Group). Bob noted that we have seen some innovative results today. The presentations have demonstrated that factors outside our control have a huge impact and lasting impact on salmonids. The only response I can see is to focus on preparing the salmon resource for variability. Do the panelists see any changes in management institutions indicating a more integrative approach?

Bill T. Bill enthusiastically replied "heck yeah". Washington's Department of Fish and Game is undergoing a major review of how they are using hatcheries. A huge amount of effort is aimed at maintaining diversity, in contrast to the monocultures of the past. The agency is spending a lot of time looking at the role of technology. The Catch-22 with technology, however, is this: technological fixers may be influencing adaptation in ways we don't know yet, giving advantages to some parts of the population in ways that we may not understand (ex: barging salmon around dams). Applying new science is further along in hatcheries and harvest management than other areas.

Scott. There is a big change in the fish and wildlife agencies to a much more integrated approach – not just harvest, but conservation. But practically speaking, many fish and wildlife agencies do not have statutory authority and sometimes not much more than a voice at the table. There has been a lot of discussion today on productivity. Viable population requires diversity and productivity; if productivity is good, pioneers will populate new areas, contributing to more adaptability. Absent productivity, it is important to do what you can to distribute the stocks more to get strains to adapt to different areas (a project ongoing in Idaho). The question is, will it be enough given long-term climate change?

Mike M. An integrated solution is the only way to get a long-term solution. Institutional issues need to be addressed. Without leadership from the states, federal government, and tribal governments, an integrated solution won't happen. It will take a big regional effort.

David W. Within the Oregon Department of Fish and Wildlife, a definite change has occurred in the last few years in how they manage fish. We are no longer fooling ourselves that we can manage these resources. There is a shift from maximizing harvest to long-term conservation plans. A caveat, however: we manage the fish, but we don't manage their habitat.

Kyle Martin (Columbia Basin Intertribal Fish Commission; audience member). Kyle advocated that there is flexibility on the mainstem by thinking outside the box, e.g., shifting flood control rule curves. Kyle asked the panel what mitigation options can be taken. One suggestion is building more storage reservoirs specifically to help fish, such as the proposed Black Rock dam in Yakima (recognizing that there are tradeoffs).

Ed M. Ed asked in general, where are you going to build it?

David W. Dave noted that there are no good new dams. The side effect of this suggestion is that you end up negatively affecting non-anadromous fish (ex: bull trout).

Patty Glick (National Wildlife Federation; general audience member). Patty asked if anyone was aware of efforts to integrate climate projections into operations and management to head off conflicts and explore opportunities for more flexibility.

Mike M. Mike stated that CRITFC has seen the need to diversify the power generation options for the region. Mike recommended looking at the CRITFC report titled "Tribal Energy Vision" (http://www.critfc.org/legal/legal.html).

Tom C. Tom noted that there is no forum to talk seriously about hydropower and fish scenarios.

Bill T. Bill commented that it is clear that the system is getting tighter. There has been less collaboration and more polarization in the last few years. Bill reiterated Tom's observation that a forum is needed to address these [hydro-fish] issues.

Professor Miles asked the participants to consider that last three questions. These questions were:

- Do the current management techniques and procedures we rely on to buffer salmon populations against seasonal to interannual climate variability actually increase vulnerability to decadal scale climate variability and change by reducing adaptability?
- How can climate information be better integrated into short-term and long-term management strategies and decision-making processes?
- What advice do the panelists have for the way forward?

Bill T. Bill suggested that the region should be testing management scenarios against future conditions to see how well the strategies measure up against the bad years. We know from the experience of the 1990s what the bad years may look like. We can't expect miracles.

Scott M. Scott noted that from a research perspective, we have learned how important the ocean is. We haven't been able to differentiate what portion of smolt-to-adult survival is coming from variable ocean conditions and hatchery operations. Doing so would be huge.

Tom C. Tom noted that management has evolved to handle short term variations better than long-term variations. Maybe techniques can put better context on what's expected two to three years out. Most Columbia River basin stocks are pretty sensitive; pre-season projections play less of a role than they used to (except fall chinook). Integrating climate information into long range-planning requires taking a step back in recovery planning and identifying areas that would be strong holds under different scenarios (i.e., less vulnerable areas). We also need to reach a balance between looking at individual populations and groups of fish.

Mike M. Mike commented that the Oregon Coast Natural (OCN) coho model is useful but chinook more complicated. To integrate climate information into wider forums, we need better pathways for research to reach policymakers in the right decision-making time frames.

Dave W. Dave commented that we have a long way to go to make sure that we aren't increasing vulnerability. We need to better integrate climate information into non-harvest decisions.

Audience questions/comment. Are there any lessons to be taken from basins to the south, e.g. the Klamath and/or the Sacramento? Are there any indications of fish adapting to warmer climate?

Bill T. Bill noted that we are seeing adaptations with fall Chinook, a highly flexible species, that include reservoir rearing and migration changes (yearlings going out with a cooler spring freshet). There is more concern with spring Chinook. Regarding the first part of the question: yes, lessons have been taken from those basins. The main lesson: try not to let things get any worse.

Scott M. Scott commented that the Klamath was a classic western water battle. Low flows led to temperature and oxygen problems that led to fish kills. In Idaho's Sawtooth Mountains, there has been huge pre-spawning mortality this year even at high elevations because of the recent Idaho heat wave and warm water temperatures. Any fish with a scratch for a fungus and died. This does not bode well.

Bill T. Bill concluded the session by noting that in the Fraser, spawning mortality this year topped 90%.

Discussion on findings from Mantua and Francis (2004) "Natural Climate Insurance for Pacific Northwest Salmon and Salmon Fisheries: Finding Our Way through the Entangled Bank" (3:15-4:20)

The discussion on the Mantua and Francis 2004 paper began with a brief presentation from Nate Mantua of the UW Climate Impacts Group on recent changes in the Pacific Decadal Oscillation (PDO), a natural oscillation in the north Pacific that has exhibited broad 20-30 year swings on north Pacific ocean sea surface temperatures with implications for PNW salmon. Nate's presentation noted that the inverse pattern of the PDO has broken down over recent years. More specifically, the warm north Pacific pattern seen from 1990-1997 did not match the PDO pattern of the past. The cooler 1999-2002 period also differed from past PDO patterns but was a little closer. Ocean temperatures have been warm for the last couple years yet both Alaska and PNW salmon stocks have been high. Nate is forecasting that the PDO will continue to be in a warm phase but there are still a lot of mixed signals. It is this mixed bag, Nate concluded, that we have to try to make sense of.

Bob Francis, also of the UW Climate Impacts Group, then gave a presentation summarizing the key findings of the Mantua and Francis 2004 paper titled "Natural Climate Insurance for Pacific Northwest Salmon and Salmon Fisheries: Finding Our Way through the entangled bank" (to appear in American Fisheries Society Symposium vol. 43). Bob differentiated between what Holling (1993) considers 1st stream science and 2nd stream science.

- *First stream science*. In first stream science, systems are predictable and science is based on parts of the system. First stream science seeks explanation and prediction, implying that we need scientific certainty before taking action. Command and control management requires developing a solution for a problem (e.g., barging salmon) with the common byproduct that variability is reduced.

- *Second stream science.* Second stream science, on the other hand, is the science of integration. Second stream science is comparative and seeks understanding of how and why resources vary. Second stream science accepts unknowability and unpredictability. The Golden Rule of second stream science, as presented by Bob, is summarized in the following statement from Holling and Meffe 1996: "Resource management should strive to retain critical types and ranges of variations in ecosystems". Second stream science facilitates variability rather than reducing it.

Bob then went on to the main points of the paper. Main contentions include the following:

1. Sustainable wild salmon populations and sustainable salmon fisheries are tightly linked. We have to have viable fisheries to sustain wild salmon. Over-preservation is just as much a threat as over-harvest.
2. We have developed conflicts between those who want to preserve wild salmon and those who want to preserve salmon fisheries. These perspectives have led to a lose-lose situation.
3. Climate enters the picture in the treatment of variability (impact on productivity) and limitations on ecosystem predictability.

Francis and Mote advocate that three things need to happen in order to integrate climate information into sustainable salmon management policies:

1. De-emphasize the role of preseason run-size predictions in management activities;
2. Emphasize preseason and in-season monitoring of both the resource and its environment; and
3. Focus on strategies that minimize the importance of uncertain climate variability and change scenarios to increase the resilience of short and long-term planning decisions.

Audience members were asked to comment on these findings and the concept of developing climate insurance for PNW salmon.

Kyle Martin (Columbia River Intertribal Fish Commission). Some people argue that the Columbia is so messed up that returning to a normative system wouldn't matter.

Mark Scheuerell (NOAA Fisheries). In response to Kyle's comment, Mark commented that he is constructing a habitat-based model for examining "reasonable approaches" for returning to normative conditions. The model effort has been effective so far. In Snohomish County, a policy group is buying into the process because the approach allows them to be part of the process.

Nate Mantua (UW Climate Impacts Group). Nate noted that a positive move is integrating climate variability and climate change scenarios into habitat assessments. Work is in progress to do this.

Audience comment/question. An audience member asked how we sell this concept when the insurance rates are so high?

John (last name unknown). John suggested getting salmon out of the box of recovery and the Endangered Species Act and instead look at it as an indicator species for our region.

Alan Hamlet (UW Climate Impacts Group). Alan asked if there is a process for developing such policies? There are few roadmaps for identifying strategies. Water management tries to minimize influence of climate variability on irrigation and hydropower.

John (last name unknown). John reiterated an earlier recommendation that a forum with a strong chair is needed. For example, there has been some success in Puget Sound, thanks to having Bill Ruckelshaus as chair.

Audience comment/question. Much of the focus is on the need for fisheries. Why must salmon fisheries exist for salmon preservation? There is a general opinion that there would be no interest in preserving salmon if there were no fisheries. The salmon would be gone in 10-15 years. The actions we are taking for the salmon are not necessarily balances to other species (e.g. sturgeon). The same effort hasn't been applied to eagles or the wolf (non-economic species).

Bob Francis (UW Climate Impacts Group). Bob noted that salmon have nutritive value as well as economic value.

Bill Tweit (Washington Dept. of Fish and Wildlife). Bill agrees. Fishermen make a powerful constituency. There is much to be discussed on this, but it's off the point.

Monty Schmitt (Natural Resources Defense Council). Monty commented that relating a management activity to the economic value of salmon (e.g., saying that X acre feet of reduced hydropower will deliver X many salmon) doesn't justify policies. We have to focus on the whole ecosystem and making a more dynamic habitat.

Pete Lawson (NOAA Fisheries). Pete noted that 20 years ago Oregon had more of a culture of conservation. This seems to have been lost with immigration of out-of-staters.

Bob F. Bob responded, stating that we can't go back to the way it [the Columbia River Basin] was 100 years ago.

Ed Miles (UW Climate Impacts Group). Ed noted that nature is adding up the bill and in the next two decades we will be presented with the bill.

Scott Marshal (Idaho Dept. of Fish and Game). Scott commented that it is hard for people to grasp the diversity of the problems and the time frames. Options have been reduced; many irrevocable changes have been made. Climate insurance requires "picking around the edges". The question is, are there enough options left? For example, where can salmon spawn? Many places are off limits.

Patty Glick (National Wildlife Federation). As the final comment of the discussion, Patty noted that non-governmental organizations have done quite a bit about messaging and communications. We need to personalize the problem and present solutions. Looking at localized effects to show how impacts affect the stream in your back yard helps with messaging.

Discussion on Research Needs and Outreach Suggestions (4:20-4:50)

The last discussion of the day was a brief session asking the audience to identify research needs and outreach strategies that may be helpful in integrating climate information into PNW salmon management and recovery activities. The session was led by Dave Fluharty of the UW Climate Impacts Group.

Kyle Martin (Columbia River Intertribal Fish Commission). Kyle started the discussion by noting that the federal action agencies (the Bureau of Reclamation, the Army Corps of Engineers) were not at the meeting and needed to be. Kyle emphasized that turnover in military leadership plus recalcitrant staff at the Corps is a particular problem.

Audience comment. Long-term records of salmon abundance in past warm-dry periods would be beneficial for examining how specific species fared during past dry periods.

Audience comment. Learning how to mix the science and policy and how to message it would be good. Top-level Corps people aren't likely to plan for climate change. Go to mid-level people, e.g., flood districts. Look at how flood frequency curves will change.

Sarah Brace (Puget Sound Action Team). Sarah suggested looking at the role of global change in transport of airborne pollutants, e.g., contaminant deposition in snowpack and runoff. Also, use local comparisons to show what an abundantly populated ecosystem (one stream vs. another) might look like. Compare salmon populations in a heavily managed stream with a natural river to see what a viable population might look like.

Howard Schaller (U.S. Fish and Wildlife Service). Howard noted that there are plenty of indices of ocean and near-shore conditions. Some are good predictors for different stocks, but sometimes they stop being good predictors. Focus on describing near-shore environment. What are the actual effects of the near-shore environment on productivity?

Patty Glick (National Wildlife Federation). Patty suggested promoting more economic analysis (both market and non-market based analyses).

Rishi Sharma (Columbia River Intertribal Fish Commission). Rishi recommended focusing research on issues of scale. How does this PDO, for example, translate to local impacts along the coast (the Oregon coast versus the Washington coast versus Puget Sound, etc.)? Also, we need more broad-scale evaluation of patterns in return rates and what's going on in the ocean. What role does ocean play in smolt-adult-return ratios?

Rich Zabel (NOAA Fisheries). Rich noted that ecosystem management recognizes both gradual change and threshold changes. Is anybody looking at tipping points or thresholds of major change in the climate system?

Pete Lawson (NOAA Fisheries). (Responding to Howard's earlier comment) The Bonneville Power Administration is funding some work in the Columbia River plume. It would be good for them to hear that this kind of research is valuable. Certainly fish habitat is buffering fish populations from changes, especially in the estuaries, which are hugely important and easily affected by human activities. We might want to look at estuaries and their role in buffering fish populations.

Audience comment. A member of the audience suggested more research on where the PDO is at and where the fish are relative to PDO [sea surface temperature] anomalies. What are fish survival rates in various places?

(Note: the following suggestions were made during the panel discussion and are repeated here given their relevance to the discussion on research and outreach needs.)

Tom C. We need more risk analysis. What are the trade offs? We need more work on how to express the results of risk assessment tools.

Tom C. Tom noted that there is no forum to talk seriously about hydropower and fish scenarios.

Scott M. …We haven't been able to differentiate what portion of smolt-to-adult survival is coming from variable ocean conditions and hatchery operations. Doing so would be huge.

Tom C. …Maybe techniques can put better context on what's expected two to three years out…Integrating climate information into long range-planning requires taking a step back in recovery planning and identifying areas that would be strong holds under different scenarios (i.e., less vulnerable areas).

Concluding Remarks

Ed Miles concluded the day's meeting with several comments. Ed was very heartened by the two case studies presented by Mark Scheuerell and Rich Zabel. The conversation between scientists and mid-level technical people is well underway. The management side is also moving forward, e.g. the Washington Department of Fish and Wildlife. Ed agreed with Kyle's earlier comments that "the Corps is the stone that never budges". What we suggest seems to be within the range of their discretion, but they hide behind "these are our instructions".

Ed noted that the CIG can provide the neutral forum to bring hydro and fish interests together. The salmon management problem is a fully coupled problem between the terrestrial and the ocean systems. On the freshwater side, the issues are water quality as well as quantity and timing. On the ocean side, the good years and bad years are linked and we are working to understand how.

Ed identified several challenges.

1. Climate has warmed in the last 50 yrs. In the most temperature-sensitive mountains in the western U.S., the cause of the warming is irrelevant. The adiabatic lapse rate is a severe constraint.
2. We are a snowmelt-dominant system. Seventy percent of our storage is snow. We are not Colorado (with its ample storage). There is no possibility of building new storage on the Columbia River. Salmon habitat has been devastated by human activities.
3. Adaptation is not only a function of the magnitude of change but also of the rate of change. How much time do we have? Our projections are conservative. Will ENSO and PDO continue to function as we know it with a warmer ocean? What about changes in extremes, ENSO and PDO, abrupt changes?
4. We need to better balance short term and long term perspectives.

Meeting adjourned.