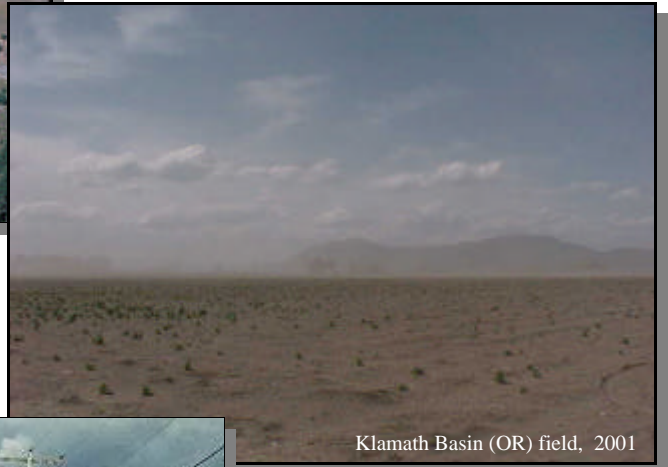
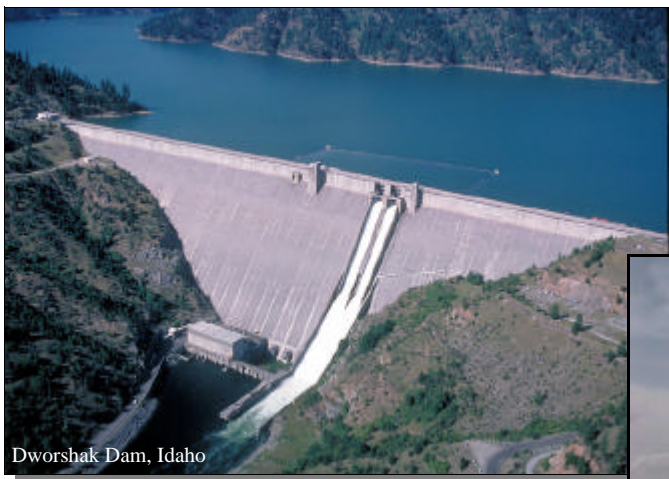


CLIMATE AND WATER POLICY WORKSHOP

DETAILED SUMMARY

*July 16-17, 2001
Skamania Lodge, Stevenson, Washington*



**Climate Impacts Group
University of Washington**

DETAILED SUMMARY OF THE CLIMATE AND WATER POLICY WORKSHOP

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The Climate Impacts Group at the University of Washington assembled many of the region's senior water resource managers, policy makers, and users at Skamania Lodge on July 16-17, 2001, to discuss the implications of climate variability and climate change for water resources and water policy. The following is a detailed summary of the meeting. An executive summary is available by contacting the CIG or by visiting the CIG web site.¹

MONDAY, JULY 16, 2001

8:30-5:30

Edward Miles, leader of the Climate Impacts Group (CIG), began the meeting with a brief overview of the challenges facing Pacific Northwest water resources, the role of the CIG, and the purpose of the meeting.

Research conducted by the CIG on the impacts of climate variability and climate change on the Pacific Northwest environment indicates cause for concern, particularly in the realm of water resources. Warming temperatures could significantly impact winter snowpack and precipitation, leading to reduced summer flows. The region needs to consider "buying insurance" in the form of planning to reduce vulnerabilities and increase adaptability to these changes. Given that it takes 20-25 years to change water supply systems, it's clear that we are late getting started.

With respect to adapting to climate change, CIG is not an advocate for policy positions except in two cases, i.e., the need to build climate change into long-range plans and the need to build a comprehensive database to facilitate integrative planning for resource management on a watershed basis.

Water is the most critical element to the ecosystem and natural resource economic health of region. It is for you [meeting participants] to say what measures will best serve the region's collective needs under conditions of significant growth in population, Endangered Species Act (ESA) applications to water supply, and probable declines in supply under certain conditions of climate change. Droughts - particularly multiyear droughts - are our greatest vulnerability.

The CIG has taken the initiative to begin this discussion. We offer ourselves as a back channel arena with a certain amount of technical expertise related to the problem in which we can discuss these highly sensitive issues off-line and see whether we can develop some consensus on the types of insurance we need to buy.

We don't expect that all the problems will be solved here [at the Skamania meeting]. We expect only to start the ball rolling, following up this initial meeting with others in different regional locations. The CIG has prepared three White Papers to stimulate

¹ CIG website: <http://jisao.washington.edu/PNWimpactrs>

discussion in the breakout groups. The dialog need not be focused exclusively on these papers. They are merely devices to facilitate engagement.

Monday Morning Presentations

8:45-12:00

The morning proceeded with a series of presentations on climate change, potential impacts on water resources, and adapting to climate change. Copies of the five presentations are available on the CIG web site.

Presentation 1: “Global and regional climate change: What we know and don’t know” – Dr. Philip Mote, JISAO Climate Impacts Group, University of Washington

Dr. Mote’s presentation addressed what is known about climate change and how well it is known, projections of global climate change, and projections of regional climate change. Highlights of the presentation include the following:

- There are varying levels of certainty in climate change findings. Scientists are certain that carbon dioxide and other greenhouse gases warm the planet. Scientists are also certain that greenhouse gases have been increasing (carbon dioxide concentrations up 32%) and will continue to increase because of human activities. Further global warming in the range of 1.4-5.8 °C (2.5-10.4 °F) is very likely by 2100. This is faster than any time in the last 10,000 years.
- Evidence that Earth is warming includes: thermometer readings, melting arctic permafrost, most glaciers melting worldwide, thinning arctic ice, earlier spring, and borehole temperature readings.
- Evidence that humans are responsible for warming includes: unusual rates of warming (abrupt increases during the 20th century), difficulty in attributing total warming to natural causes such as volcanic, solar, and ocean influences, and the pattern of warming.
- Temperature trends in the Pacific Northwest indicate warming throughout the region. Urbanization is not a major source of warming.
- Climate model projections indicate that average summer temperatures in the Pacific Northwest could increase by 3.1 to 6.7 °F (mean change of 4.7 °F) by the 2040s; average winter temperatures could increase by 3.2 to 6.7 °F (mean change of 5.2°F).
- Climate model projections of average summer/winter precipitation changes have wider ranges. Average summer precipitation may range from a 7% decrease to a 9% increase by the 2040s; average winter precipitation may range from a 2% decrease to a 22% percent increase (summer = April-September; winter = October-March)
- Regional warming is likely to be faster than global warming (3-6 °F by the 2040s).
- Despite uncertainties, global climate change is well established enough to take precautions.

Presentation 2: “Effects of Climate Change on the Hydrology of Water Resources of the Pacific Northwest and Columbia River Basin” – Prof. Dennis P. Lettenmeier and Alan F. Hamlet, JISAO Climate Impacts Group and the Department of Civil and Environmental Engineering, University of Washington

The second presentation examined (recent) historic effects of climate change on water resources,

methods for quantifying and evaluating the hydrologic impacts of climate change, and areas of concern for water management. Highlights of the presentation include the following:

- A variety of graphs and figures detailing previous and potential impacts of climate variability and climate change on the Columbia River at the Dalles and the Cedar River. The presentation also assessed changes in the reliability of water resource objectives (flood control, firm energy, non-firm energy, Snake River fish flows, Mainstem Columbia fish flows, Snake River irrigation, and Lake Roosevelt recreation) as a result of climate change.
- The primary impact of warming in the Pacific Northwest is loss of mountain snowpack. Warmer temperatures generally result in higher winter flows, lower summer flows, and earlier peak flows.
- There are significant uncertainties regarding changes in precipitation and the resulting intensity of summer streamflow reductions and increases in the frequency of droughts. Despite these uncertainties, however, a consistent and robust result is that some reduction in summer streamflow and increase in drought frequency is present in all scenarios by the 2040s for the Columbia basin. The reductions in summer streamflows are likely to exacerbate existing conflicts over water, the impacts of regional growth, and weaknesses in infrastructure, water management practice, and management institutions.
- Areas of concern include:
 - limited reservoir storage (and limited opportunity to build more),
 - water supply systems operated close to supply limits,
 - use of historic streamflow record for long range planning (the past will not necessarily be an accurate predictor of the future because of climate change),
 - use of statistical streamflow forecasting tools based on 30 year streamflow record,
 - inflexibility and fragmentation of water management institutions,
 - limited use of available streamflow forecasts incorporating climate change information, and
 - changes in intra-regional water availability.
- Pacific Northwest hydrology is predominantly controlled by winter conditions. Transient snow basins (basins at the edge of the snow line) are most sensitive to warming.

Presentation 3: “A Preliminary Analysis of the Impacts of Climate Change on the Reliability of West Side Water Supplies” – Prof. Richard Palmer and Margaret Hahn, Department of Civil and Environmental Engineering, University of Washington

Professor Palmer’s presentation addressed water supply challenges, water supply resources, and water demand for urban areas. The presentation also addressed climate change impacts on streamflow and storage. Focus areas for the presentation included the City of Portland and urban water supplies in the Puget Sound area (Seattle, Tacoma, King/Pierce/Snohomish Counties). Highlights of the presentation include the following:

- Water demand and precipitation patterns are out of sync – highest demand comes when precipitation is lowest.
- Goals for urban water suppliers are to provide safe, reliable, and inexpensive water to customers; goals must be balanced with environmental, cost, performance, and diverse customer desires.

- Urban water demand influenced by: population, industry, housing mix, lot size, weather conditions (including temperature and precipitation), plumbing codes, and public response.
- Puget Sound area water demand is expected to increase in average years from 435 to nearly 500 million gallons per day (15% increase) by 2020.
- Portland area demand is expected to grow from 120 to 150 mgd (25% increase) by 2020
- Increase in demand will stress systems that are already near system yields.
- Climate change will significantly impact the timing of the region's runoff by 2040. The lack of late spring snowpack will decrease the "stored" water available for the summer. This will extend the drawdown period and make the region more susceptible to drought.
- Climate change will also significantly impact annual minimum storage. Storage similar to those encountered in 1987 and 1992 will become more commonplace, even without increases in demand.
- Long-lead time, adaptive planning is needed to face these challenges.

Presentation 4: "Climate Variability and Human Adaptation: Some Thoughts on the Water Law and Policy Environment" – Dr. Doug Kenney, Natural Resources Law Center, University of Colorado

Dr. Kenney's presentation addressed the challenges of climate change policy and adaptation. Highlights of the presentation include the following:

- Policy-makers don't listen to climate scientists due to language barriers, the perception that climate change is not a fixable problem, and the belief that the problem is being handled at other levels. The one exception to this is drought.
- Using climate forecast information is professionally risky. Mistakes are tolerated if conventional techniques are used; not so for innovative techniques (e.g., climate forecasting). Demand to increase use can come from peer pressure and customer demand.
- Water management regimes are inefficient by design. These regimes are designed to serve antiquated allocations. Water is free and distribution subsidized; power is cheap. If we take subsidies out of water we can solve problems but this is not politically feasible.
- Even without climate change, vulnerability to drought is increasing due to population growth and trends in water law and policy reform
- Real long-term solutions are generally off the table. New development is doomed unless non-traditional; limit population growth (possible?)
- Best coping strategies entail risk management - reduce risks and reallocate risk
- Reducing risks involves promoting saved (or salvaged) water, promoting conservation (through voluntary efforts, price signals, technology, and mandates), and improving project and water system efficiency.
- Re-allocating risk: through permanent water transfers and temporary transfers (subordination agreements, dry year options, lease back arrangements, and water banks)

Presentation 5: "Adapting to Change and Uncertainty: Lessons From the West Coast of North America" – Prof. Chad Day, School of Resources and Environment, Simon Fraser University and Dave Marshall, Fraser Basin Council, Vancouver, British Columbia

Professor Day's and Dave Marshall's presentation compared the Columbia Basin with three large-scale governance systems and discussed the effectiveness of our decision-making systems. CALFED Bay-Delta Program, Puget Sound Water Quality Action Team (PSWQT), the Fraser Basin Council (FBC), and the Columbia were featured watersheds/watershed groups. Highlights of the presentation include:

- Criteria for evaluating watershed planning efforts: legislation; adaptive planning, implementation, and monitoring; representation; financing; leadership; and outcomes.
- British Columbia's Fraser Basin Council is an example of a successful large-scale watershed governance system. The Council is "governed" through a partnership with the federal, provincial, and local government, the First Nations (tribes), the private sector, and civil society. The Council is unique in that it brings a broad range of perspectives together, serves many roles within the Basin (catalyst, sustainability educator, facilitator, and conflict resolution agent), and develops new modes of cooperative decision making. The Council does not have any legislative authority.
- Columbia Basin Treaty really managed by BC Hydro, U.S. Army Corps of Engineers, and the Bonneville Power Administration.
- No forum exists in the Columbia basin where all interests can meet and share views and preferences for managing the Columbia basin. There is no coordinating institution such as CALFED, PSWQT, and FBC in the Columbia.

Lunch and keynote address by Governor Daniel J. Evans

12:00- 1:15

Former Washington State Governor and U.S. Senator Daniel J. Evans gave the keynote address during lunch on Monday, July 16. The address touched on a variety of Governor Evans's experiences as Governor and Senator. Governor Evans also recommended buying "insurance" against climate change in light of risk and uncertainty through planning and public policy decisions.

Breakout Session summaries – Monday, July 16

1:30-4:15

During the afternoon, meeting participants assembled into three separate breakout sessions. All groups were assigned the same discussion questions. Meeting participants were assigned to groups according to their geographic location and area of interest. Participants for each breakout are listed below as assigned. Please note, however, that actual participation may have varied depending on attendance in the afternoon sessions.

Discussion questions focused on projected changes in snowpack and streamflow, impediments to using climate change, policy and planning opportunities, and adapting to climate change. *Although the questions were specifically listed, discussions in the groups varied significantly to include much broader discussions on climate change.* For the purposes of this summary, each breakout session is transcribed based on handwritten and typed notes from the official notetakers for each group. Comments are assigned to speakers when known. Please see "Report to Plenary – July 16" for additional summary points.

Group 1 – Discussion leaders/Note takers: Dennis Lettenmeier, Nate Mantua, Richard Slaughter

Participants:

- Gustavo Bisbal Northwest Power Planning Council
- James Buizer National Oceanic and Atmospheric Administration
- Jack Clark City of Kennewick
- Linda Crerar Washington Department of Agriculture
- Karl Dreher Idaho Department of Water Resources
- Angus Duncan Bonneville Environmental Foundation
- Karen Fraser Washington Senate Environment, Energy, & Water Committee
- Kindy Gosal Columbia Basin Trust
- Doug Kenney University of Colorado, Law School
- David McAllister Oregon Department of Fish and Wildlife
- Ronald McKown Bureau of Reclamation
- Ken Messerle OR Senate Natural Resources, Agric., Salmon, and Water Com.
- Jim Milton Tri-County Water Resources Agency
- Laird Noh Idaho Senate Resources & Environment Committee
- Gary Passmore Confederated Tribes of the Colville Reservation
- Jack Robertson former Acting Administrator for Bonneville Power Administration
- George Schneider Seattle Public Utilities
- Doug Smith BC Hydro
- Harvey Thorleifson Natural Resources Canada

Group 1's discussions focused on issues of climate change and public policy and energy issues (as they related to supply/demand issues and price controls). Major points/questions raised by Group #1 included:

- Planning/climate science uncertainties
- How do you make the leap from climate change as a regional issue to aiding the development of regional management infrastructure?
- The struggle to get climate change adaptation on the public and planning (public and private) agenda. Impact of climate change is too far off in public perception.
- Addressing electric power production (seen as limiting flexibility of water use).
- The value of price signals as a way to manage demand.

Karen F.: Good information on climate change is now on hand. How do we get this disseminated to a wider audience?

Laird N.: Knowledge gaps still pretty big. Ex: Idaho surface water/groundwater connections. Not much known about that but policy momentum building for aquifer recharge.

Angus D.: Climate change was put on the Northwest Power Planning Council agenda 10 years ago but it generated zero interest. At a meeting of energy managers last May, the big issue was when the Federal Government would provide leadership/guidance for how industry should/will have to respond to this [climate change]. How do you make the leap from climate change as a regional issue to aiding the development of regional management infrastructure?

Other issues will likely drive this kind of policy reform/regional institutions.

Jack R.: Evidence for climate change is building. However, climate change does not present compelling case for immediate action. Why? Projections indicate little impact on firm energy even 40 years into the future. There are much more pressing issues right now (drought, energy crisis). We still need more specific information on regional weather – presentation information still to general. Want information on Pacific storms, jet streams, shifts in El Nino Southern Oscillation (ENSO) variability.

Dave M.: Climate change seems compelling to me, especially because of challenges to salmon recovery. I can take this info and extend/apply it to specific issues for evaluating policy options.

Dennis L.: Uncertainty is still large on many issues, science and political. The issue may be more about planning under uncertainty

Karl D.: The different scenarios are confusing.

Richard S.: Climate models are improving; the questions are getting more focused and getting to the cusp of addressing specific issues/planning questions. This gives the models lots of potential applications. For example, Idaho State Lands is considering a ski resort development at a location with marginal snow conditions. Idaho P.U.C. recently shifted its preferred alternate resource from coal to gas based solely on the cost at that time. There is no consideration for emissions. There is lots of room to identify new issues/applications.

George S.: I sympathize with Karl Dreher's questions about modeling "my resource". SPU had a similar experience with University of Washington modeling. Seattle Water Supplies prompted the Seattle PUD to take more active role in this modeling work. They partnered with UW to model climate change impacts on Seattle supply (Tolt, Cedar) and demand.

Doug S.: Relative uncertainty in future demand and supply?

Dennis L.: It is site specific. UW did studies for the Corps and found some cases where demand uncertainty swamped climate change uncertainty. Need seems clear for application to long term plans, e.g. Cedar River salmon recovery plans.

Angus D.: Gustavo, any climate change considerations in the Northwest Power Planning Council fish recovery plans?

Gustavo B.: No.

Kindy G.: It is not yet happening in Canada either.

Angus D.: The Power Planning Council handles lots of issues sensitive to climate. Power storage and transmission, use of alternative energy systems (gas for heat rather than electricity). There are plenty of current issues that highlight vulnerability to climate. The PPC has avoided questions of water law and this clearly hamstrings capacity for regional planning.

Jack R.: Looking 20-40 years into the future, it is pretty clear that population and demand for electricity will definitely increase. Climate change aside, there is a big need to reform water supply system.

How do you work on supply? Do you work on electricity production with new technology?

Jack R.: It needs to be something other than simple incremental changes, instead time for radical change. New technology may be fuel cells, whatever, but it requires huge jump in efficiency for electric production.

A top issue is electric power production. Address that and you gain a lot of flexibility with water in our rivers.

Laird N.: The big surprise for many has been the big jump in electric power demand driven by information age technology. The public needs to be educated about energy costs of new technology; better define energy costs.

Doug S.: Price signals used to be in place. Start demand/use metering to ease consciousness and add price signals.

This must be done soon; needs political leadership.

Angus D.: Ten years ago the Power Planning Council predicted 2 MW deficit. They got it right! (for surprising reasons)

Jack R.: The uncertainty for electricity prices was very wide 10 years ago and recently broke through top and bottom. Climate change or not, a big crisis looms if we don't change.

Richard S.: The region's recent experience shows how effective and quick active price signals work – allowing market to drive change better than developing a new regional policy group.

Karl D.: A new regional authority is a bad idea. We need to connect existing agencies. Behind the scenes negotiation between ID, MT, WA/OR making strides. One idea – create a regional water bank with provisions to protect some low economic activities (e.g. regional economies). Salmon recovery bureaucracy is not the model to follow. Regulatory actions make reform very difficult if not impossible (ESA, ACOE flood control). Start with Water Resource Agencies trying to marry up discussions/activities with fisheries agencies. This stalled when the Idaho Fish and Wildlife director was dismissed. You do not need a top down model but bottom up.

Linda C.: Our culture loves engineering solutions, which allows for widespread denial. The experience of the Washington Department of Ecology – Washington water problems due to water mismanagement, an old story that's wedded to denial

Jim M.: That is true to a degree in Yakima yet planners there recognize the longer term crisis. They are still looking for good reason/motivation for various agencies to come together.

Angus D.: One problem with ad hoc planning is the need for willing participants. Here, institutional reform benefits from opening up discourse to all affected participants, not a

command and control approach (e.g., NMFS and Klamath Basin). There are many examples that are more successful and not in the news. The folks in Klamath Basin need a clear understanding of long term resource plans, a view of the future that allows them to cope.

Karl D.: I would factor in potential consequences of climate change in the evaluation of policy alternatives but I would not make big investment decision based on the White Paper info.

Angus D.: Regardless of climate change, big problems exist.

Richard S.: Boise River irrigators dealt with big reduction in flows; faced a similar situation as those in Klamath Falls?

Karl D.: The Boise River irrigators did not really have that bad a supply problem.

Laird N.: Consider another point: there is now a new group of heavy hitters in Northwest water – big hydropower utilities have major senior water rights. What might that mean?

(end of notes for Group 1, Day 1)

Group #2 – Discussion leaders/Note Takers: Richard Palmer, Philip Mote, Don Reading, Lara Whitely Binder

Participants:

- Brian Allee Columbia Basin Fish and Wildlife Authority
- Jeff Allen U.S. Congress
- Jim Barton U.S. Army Corps of Engineers
- Harold Blackwolf, Sr. Confederated Tribes of the Warm Springs Reservation
- Brian Brown National Marine Fisheries Service
- Paul Cleary Oregon Water Resources Department
- Lee Faulconer Washington Department of Agriculture
- Stan Fox U.S. Department of Agriculture, NRCS (OR)
- David Goodrich National Oceanic and Atmospheric Administration
- Blair Henry Northwest Council on Climate Change
- Steve Johnson Washington Public Utility District Association
- Wayne Lei Portland General Electric
- Stephen Lipscomb U.S. Geological Survey
- David Marshall Fraser Basin Council
- Larry Mattson City of Yakima
- Thomas Myrum Washington State Water Resources Association
- Alexandra Smith Bonneville Power Administration
- Doug Sutherland Washington Department of Natural Resources

Group #2 began with a general discussion of the morning session presentations. Participants were asked if they had any questions or comments. Discussions then progressed to the questions listed for the breakout sessions. Group #2 was not able to complete the remaining list of questions in the time frame provided. Major points/questions raised by Group #2 included:

- The need for sub-basin level planning; bringing climate information down to the planning level.
- The need to discuss increased flood hazard in addition to drought.
- Likely losers in reduced water flows: fish
- How will climate change information be used?
- The Klamath situation (discussed in general).
- Climate change planning and the parallel to Y2K preparations – planning for uncertainty.
- Impediments to using climate information: climate change is a political issue; issue is not really quantitative; human nature (discounts events 20-40 years off). The public doesn't accept it [climate change] or doesn't demand action on adaptation.
- Suggestions for more targeted discussion.

Wayne L.: Out-of-box thinking has been driven by the cost of power. Could put microhydro devices on canal/flume. Are there other opportunities to adapt?

Steve L.: The timing of snowmelt may provide an opportunity to balance flood control/agriculture needs.

Blair H.: Haven't heard much about flood control issues. In focusing on possible water shortages, we are not talking about the potential for increased precipitation and flooding in the fall-spring season.

Don R.: I am wondering about total annual flow/flooding frequency.

[Rick P., Phil M. clarified the climate scenarios and flooding issues. Warming temperatures and possibly increased precipitation could increase winter streamflow as more precipitation falls as rain instead of snow. "Rain-on-snow" events (rain falling on snowpack) more likely in intermediate, or transient, level basins.]

Jim B.: The Corps bases operations on historic data. There is a push now to do system-wide evaluation. Future climate change/flood control evaluation together.

Brian A.: Regional water/salmon initiatives are being planned at the sub-basin level. How can we bring large-scale climate results down to the planning level?

Rick P.: We have the ability to look at sub-basins.

Brian A.: That would be very useful.

Moving to breakout session questions...

Question A: What aspect or aspects of the projected changes in snowpack and streamflow most concerns you, given your responsibilities?

Jim B.: Plans could start with sub-basins then aggregate up.

Don R.: Idaho seems to be treated as one reservoir. The perception in Idaho is that when Washington determines more water is needed for fish, Washington will get it from Idaho. Where

you get additional water really matters since climate change affects different areas differently. For example, a new ski resort is being considered near McCall (Idaho) but it is likely there will not be enough snow to ski in the near future as a result of changes in climate.

Lee F.: The impact on irrigated agriculture, especially in Yakima, is a concern.

Stan F.: The impact on the allocation of water rights is a concern. Water is already over allocated; allocations are complicated by ESA, CWA, population, energy. The Klamath Basin controversy is just the first of many conflicts between uses.

Paul C.: Direct flow is fully allocated throughout the West. In the Willamette, 1.2 million acre-feet are available but there will be pressure to revise rule curves on the basis of WY2001. The pressure on operations is for storage reservoirs but it is difficult to develop storage. The value placed on water is important. Water is more valuable (\$10,000/acre-foot) in Colorado but much less so here (\$120/acre-foot).

Rick P. to Jim B.: How will the Corps change as a result of WY 2001?

Jim B.: The ESA has accelerated system review. This year's drought situation will too. If there's support for it, system operation review could include climate change.

Paul C.: If we get into more winter floods and drier summers, flood control should be OK. The more variability, the more difficult.

Blair H.: A 40-year projection is not so helpful for the year-to-year manager. In the Klamath, the community didn't know it was coming. You could try to get the message across to the broader public.

Paul: There is lots of denial [in the Klamath]. The Bureau [of Reclamation] came out with a long-term plan in 1995 that said wouldn't be enough water in a 50% water year and they got sued.

Rick P.: Do you think that one response would be to educate people?

Paul C.: Yes. It will motivate storage and conservation.

Rick P.: [General comment that the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint basins in Georgia, Florida, and Alabama is in the 38th month of below normal precipitation. At the same time, development around the lake has elevated the role of recreation.]

Alexandra S.: Parts of Georgia sometime have no water in their faucets; water department staff would turn off your water if you were watering your lawn. Denver only started metering in 1986. It's not that bad here yet so people don't see the threat.

Brian A.: Are climate scenarios appropriate for sub-basins? Are they available to insert to sub-basin model assessments? We would need these – there are big implications for fish, irrigation, etc. at the sub-basin level.

Brian B.: What sub-basin planning would we be doing differently with a climate-change scenario?

Paul C.: More water in winter, less in summer means you need more storage.

Rick P.: In urban areas climate information might mean difference between a \$600 million investment next year instead of 10 years from now. The safe yield of system would be different.

Lara W.B.: At the recent [June 2001] Interim Drought Council meeting in Portland there was a lot of emphasis on local planning and management of drought rather than the standard “Federal drought SWAT team” approach. How we use climate information at the sub-basin level for adapting will depend on where we are (site specific variations).

Rick P.: Do you really think the past will happen again? A key part of the climate change message: the climate (temp/precip) range will probably be different.

Don R.: Elevational dependence key to understanding impacts.

Blair H.: Effectively looking at 1% less water each year for summer flows for the next 50 years. You can pass that on to crop planners, etc..

Rick P.: The danger is in people’s understanding of probability. What if the next year is wet?

Stan F.: 1% per year sounds too smooth. I have heard about increases in extreme events with more spikes? Some years will be more wet, others more dry.

Phil M.: The IPCC [International Panel on Climate Change] says these are possibilities. Trends in extremes difficult to detect however. How do we improve resilience? We have to do so through our structures and laws.

Brian A.: Low flow predicts juvenile survival. We really need to include climate change for forecasting juvenile survival.

Dave G.: Gradual warming, earlier peak flow...who gets short end of stick? Fish do.

Brian B.: Changes in streamflow affect different species differently. Idaho is probably worse – Snake River summer migrants are already listed. You can’t write off one species because its needs are in conflict with another.

Rick P.: With low flows, some creeks dry up. You have to do what you can.

Brian B.: From this morning’s presentation, future hydrographs climate changes but without policy changes. What will give? Fish. Flood control, power, water rights all hardwired. Fish will be the one to yield.

Alexandra S.: You cannot say they are hard-wired. It is difficult to predict cultural values over same time frame. Look at enabling legislation for dams – people were well aware fish would suffer but decided to do it anyway. Maybe hydro will not be the energy of choice. Nothing

that's hard-wired now will necessarily be hard-wired in 40 years. BPA currently has 28,000 MW of natural gas combustion turbines in the pipeline. What will the impact of that be?

Paul C.: 84% of water in Oregon is used for agriculture. The Klamath is a federal issue – a federal project where a federal ESA decision and drought has affected local farmers. Fifteen court decisions in 10 years have limited flexibility in the Klamath.

Blair H.: Evans wondered why we're leaving out the salt-water side. Ocean conditions affect salmon. No discussion of oceanographic monitoring?

Paul C.: This year will be interesting – a bad fresh water year but good ocean side.

Brian A.: Bob Francis's [at the University of Washington] efforts to develop predictive indices are important step.

Summary answer to Question A: Low flows in summer (irrigated agriculture, navigation, water supply, fish,) and flooding.

Question B: What impediments are there to incorporating these [climate change] scenarios into organizational planning efforts?

Blair H.: Climate change has turned into a political issue. Many people don't care what you say, they won't buy it.

Lee F.: If the science doesn't justify your point of view, it's "junk science". Another problem: it's not really quantitative. It will be worse, but how much worse? People will naturally resist another challenge.

Brian B.: With reservoir control, short-term forecasts put Corps in an awkward position- at the edge of probability.

David G.: Human nature discounts it if it's 20-40 years off. We train people to prepare for what happened in the past.

Larry M.: The City of Yakima is currently revising its storm water management plan. How do I sell stormwater concerns to the public? Most of the 8 inches of precipitation Yakima receives is in snow. Storm water management must merge with other issues. It is the same with climate change.

Lara W.B.: Public education important. Sub-basins may be able to identify sensitivity to climate change without models.

Steve L.: There is an analogy in the Y2K scare. Many people were left wondering if it [all the preparation] was a waste of money. At the same time, however, you wonder if it would have been worse without all the effort.

Rick P. [to Paul C.]: How long does it take to build new reservoir?

Paul C.: 10-15 years, if not on federal land.

Lara W.B.: One thing to think about as we talk about making climate change information more useful at the sub-basin level is what format the information needs to take.

Summary answer to Question B on impediments: Climate change information is too qualitative. Political considerations are also an impediment. Climate change is not accepted because of mitigation efforts (for carbon dioxide emissions). We have a lot of time before impacts will be known so we can put off dealing with it. The public doesn't accept it [climate change] or doesn't demand action on adaptation.

Question C: What items would you add to the list of policy and planning arenas on page 14 (of White Paper 2)? For each of those items,

- a) How would the identified climate change scenarios impact this policy area? Or to put it another way, what are the risks posed by climate change?*
- b) How might these impacts be incorporated in existing planning?*
- c) What obstacles exist to incorporation of climate change information into planning? e.g. legal authority, agency mission, etc.*

- Columbia Basin treaty rights;
 - other tribal treaty rights;
 - synergies of demand-side management (energy and water);
 - growth management planning;
 - forest resources;
 - rangelands, fire;
 - water quality, TMDL (total maximum daily load);
 - air quality planning
- Could be used for water use permitting?

Paul C.: Yes, but that is based on historic record.

- Water compacts?

Paul C.: The Pacific Northwest does not have traditional interstate compacts, which make it difficult.

Steve L.: [Agreed with Paul's comment]. There are a few compacts in Southeast Idaho but otherwise there are not that many.

- Long-term contracts?

Wayne L.: How much do we know about groundwater? To sell to purveyors, may want to minimize uncertainty.

- Plumbing codes?

Yes.

- Dam relicensing?

Brian B.: How would FERC [Federal Energy Relicensing Commission] use the information? Climate change may push projects closer to the edge of viability given the challenges in fighting for instream flows. FERC only cares about power, not fish

Alexandra S.: FERC should care because of power.

Brian A.: FERC could look at the scenarios and conclude that the current solution – flow augmentation – might be a lost cause and need to change rule curves to change timing of flow.

- Energy planning: distributed generation is on the way

Rick P. (general question): What will you do differently? What could we do differently?

Wayne L.: Will send hydrographs to hydropower people. Develop synergies. For the next meeting, CIG could have more industrial users here. Targeted white papers could be helpful.

Larry M.: A fact sheet with elaboration of the 17 points (in White Paper 2) would be good.

Lee F.: More outreach needed to specific audiences.

Jim B.: Ditto – for all the planners in the Columbia.

(end of notes for Group 2, Day 1)

Group #3 – Discussion Leaders/Note takers: Edward Miles, Alan Hamlet, Amy Snover, Stewart Cohen

Participants:

- Greg Armour Okanogan Basin Water Board
- Cynthia Barton U.S. Geological Survey
- Johnny Carline Greater Vancouver Regional District
- Charles Craig Oregon Department of Agriculture
- Chad Day Simon Fraser University
- Daniel Evans Daniel J. Evans Associates
- Tom Fitzsimmons Washington Department of Ecology
- Josh Foster National Oceanic and Atmospheric Administration
- Nancy Glaser Seattle City Light
- Justin Gould Nez Perce Tribe
- Steve Keller Washington Department of Fish and Wildlife
- Jeff King Northwest Power Planning Council
- Kyle Martin Columbia River Inter-Tribal Fish Commission
- Pat McGrane Bureau of Reclamation
- Steve Moddemeyer Seattle Public Utilities
- Barry Norris Oregon Water Resources Department

- Scott Pattee U.S. Department of Agriculture, NRCS (WA)
- Nancy Stephan Bonneville Power Administration
- Cameron Wheeler Idaho House Resources & Conservation Committee

Group #3 discussions began with a brief presentation from Kyle Martin of the Columbia River Inter-Tribal Fish Commission on suggested adjusted flood control rule curves for the mainstem Columbia. The ensuing dialogue loosely followed the listed breakout session questions. Major points/questions raised by Group #3 during the breakout session include:

- The need for more specificity on impacts and shorter-range forecasting;
- The need to change flood control rule curves;
- The need for more data, more funding for data collection, and better coordination of data collection/accessibility;
- The need to fold climate change concerns into other planning and monitoring efforts;
- The need for support for climate change planning “from the top” (at the federal level). The administration needs to be convinced and Congress needs to provide resources.
- Potential triggers for change (in willingness to incorporate climate change into planning).

If spring runoff is starting earlier, we have a big problem right now in the mainstem Columbia. Really need to change flood control rule curves. Same set of rule curves, re: floods on both sides of the border. This is a major source of rigidity (but a lot of ad hoc agreements don't necessarily benefit fish).

Kyle M.: There are ways of altering flood control rule curves to benefit salmon. If you loosen flood control requirements, you can store more of that water for release in the spring/summer for salmon. Flood damage would decrease w/ this change in operations (w/no climate change-related change in the hydrograph).

Pat M.: Agree with the importance of adjusting/reexamining flood control operations in light of predicted shift in the hydrograph to earlier in the spring. Last year, the Corps made BLM (Bureau of Land Management) draft reservoirs down to flood levels during the spring freshet. It would have been hard to refill given that peak flows came early last year. Needs to be accounted for in any flood control study. Would find a new, standardized data set of “climate change modified flows” useful that everyone could use in their planning.

Nancy G.: Modifying data sets for reevaluation of flood control would be difficult because data needs to be on daily time step.

Steve K.: Don't say flood control, say flood hazard mitigation – what can you do from a land use point of view to minimize the flood hazard instead of manipulating river? Am also concerned with forest fires, ocean conditions, fish returns, coastal erosion.

Kyle M.: [Pointing out Corps regulation of river at 300-350 kcfs (bank flow flood is 450 kcfs), and building on flood plain near Portland.]

Tom F.: Who's going to stand up and say vulnerability has been shifted from fish/hydro to flooding?

Ed M.: Are you using climate change in your planning? What would it take to do so?

Pat M.: BLM doesn't do it. We could – it would be easy, but isn't safe.

Tom F.: Unequivocal yes. Climate change should be built into assumptions, scenarios, planning. How do you integrate this information so that all parties can use the data and come together to develop priorities, rather than opposition advocacy groups each using the data to argue & promote their own positions?

Ed S.: Can we envision a data system that would tell you what you need to know to manage a river system so that there is no need to rely on historical data?

Tom F.: What would be the incentive to create a real-time managing capacity? The allocation process is slow and entrenched.

Cynthia B.: USGS is involved in real-time management/forecasting system tools. Limiting factors are major data gaps. There is no political will for funding necessary data collection; policies are cast in stone and cannot change as we learn. A USGS model for Yakima was used to determine this year's allocations, timing of water deliveries/pro-rations.

Tom F.: This information doesn't necessarily help. Yakima districts are pumping groundwater. The real problem is that the system is over allocated. We need to reexamine the allocation of water and redistribute it in a sensible way.

Lack of information availability – no one knows what others are doing and/or what data is available.

Charles C.: We don't have management/policy tools to deal with this increased uncertainty. Prior appropriation doesn't lock up all the water – much of it is allocated on contracts by the BLM (who owns the water right) but that water is mostly only available for agriculture and M&I uses. BLM could be reauthorized to distribute the water differently. Distribution is not subject to prior appropriation.

(change in direction of conversation)

Tom F.: Flood control modification opportunities; trade-off hydropower production for fish flows or irrigation water supply (small loss for BPA, big gain for others). Make up the energy loss with other sources

Stewart C.: A potential side effect of a fish flow operation is a region's ability to meet its greenhouse gas emission targets. There are sub-basin specific issues, e.g. the inability to meet minimum flow requirements before it's time to fill.

Scott P.: A unified database and a monitoring system are crucial. Forecasting operations are limited by data availability, not knowledge or models, and hamstrung from lack of funds. Some people propose an agency that would be responsible for data collection.

Cynthia B.: USGS *is* that agency. There is a need to coordinate efforts among agencies, eliminate redundant data collection.

Ed M.: There are three kinds of impediments to using climate change information – technical (flood control), institutional (policies cast in stone, organizational rewards/penalties for risk taking, tendencies for risk aversion), and political (allocation disconnected from data, tradeoffs become more sharply defined, advocacy problem, reallocation of impacts, political will – NRCS could update snowpack data with climate change information if Congress gave them the orders and money).

What's needed for change?

Tom F.: A lawsuit against BPA about way they ran the hydropower system this year and using power emergency to subvert ESA could be a catalyst for change. A lawsuit could result in the institution of mandatory instream flows and fish first rather than power first.

Barry N.: What is going to get the system moving? Better data, more data (Snowtel data, precipitation, live flow data) is required for people to believe you.

Kyle M.: Better forecasting tools.

Nancy G.: Need to see improvements in seasonal/annual forecasting before believing forecasts about 20 years in the future.

How do we deal with this? We're asking for a large leap of faith – what are the baby steps?

Alan H.: Planning = baby step. Plan for increased frequency of 1992. Implementation = big step. Implement the plan once the monitoring system says it's happening.

Stewart C.: There is a difference between doing planning exercises based on scenarios and doing operations based on next year's forecast.

Charles C.: You can have innovation in absence of crisis if you have a win/win situation.

Ed M.: How can you have a win/win situation with such sharp tradeoffs?

Tom F.: West side – changes in municipal water law that would allow flexibility to move water around regionally. From where it is/isn't needed, to where it isn't/is needed. Changes can be used to maintain fish flows, to increase municipality certainties. Would require a change in water law and Washington State permits. Washington DOE is working on that.

National resource agencies need to be willing to support such plans.

Lose/win situations: What type of disaster (that could credibly be attributed to climate change) would be sufficient (and could be used) to push the system to make changes?

Cynthia B.: A few more years of drought (longer-lived impacts) and sufficient impacts to raise the priority for funding. (These are required for it to become a crisis event compared to all the

other events requiring response.)

Kyle M.: It is hard to visualize what “normal” is. Climate “normals” change every ten years.

Ed S.: Doesn't that make you suspicious?

Kyle M.: Perhaps missing reservoir refill by June 30 would be a trigger.

Steve K.: Water rationing, raising cost of water, more frequent floods, if the state is on fire night after night, more frequent fish kills....all will stimulate the public to get worried and go to the legislature....

Pat M.: If there were an easily accessible data set about what flows might look like in 2002 (!) there is no reason it can't be used in modeling and planning *now*. If people started now and kept an eye on it, when credibility was achieved it would be used [very short-term forecasting again]

Cynthia B.: Need for climate change to be a priority of the administration for agencies to do anything with this information.

Scott P.: Somehow the administration *needs* to be convinced. Perhaps that's the appropriate target.)

Tom F.: Don't need climate change as a reason. We know (from the past few years) that the region is vulnerable to climate, that water resource systems are incapacitated. We have seen a big change in the past 5 years from (1) we don't have a water problem, we have a problem with your agency to (2) help us, we have a water problem, not because of your agency but because of water laws and over-allocation. No one says global warming is a problem.

Ed M.: Why isn't this info enough for you to include this info in your long-term planning?

Nancy G.: We just had 5 great years in Columbia River streamflow and this one bad year. Is this a fluke? How do we know this is really a problem? We may just deal with this one and get back to normal. Thinking about opportunities/strategies to make progress on climate change. Putting the focus on climate change is not necessarily the most mobilizing approach.

Johnny C.: A major impediment is the lack of public credibility of the problem. Contrasted lack of objections to scientific presentations this morning with responses this afternoon. Something will turn up. Climate change is not a useful motivating platform from an operations standpoint.

Tom F.: Data is very important to working our way through this but there is a lot of associated problems – historical/predictive, funding, coordination...Flood control functions, data, risks, assumptions need to be re-examined and could be a useful adaptation pathway (studies to modernize river operations, e.g. flood control/refill timing/others). Question motivating utilities on focusing on climate change alone. What is the problem? Climate change or the sustainability of natural resource systems upon which we depend? Focus instead on the lack of capacity.

Steve M.: SPU is just at the beginning of a long-term planning exercise. Going to recommend that they examine the implications of climate change scenarios for their planning. What would they need to do if these different scenarios came true? Are any responses recommended as response to many/all scenarios? If so, prioritize high.

Cynthia B.: The past is key to the future. Looking at the past is sufficient for looking towards the future. Need water use info, groundwater info – wells and monitoring and knowledge of groundwater/surface water interaction.

Cameron W.: Optimism over our ability to understand/manage all problems; science/technology can take care of the problems.

(end of notes for Group 3, Day 1)

Report Back to Plenary and At-Large Discussion

4:30-5:30

Breakout groups reconvened in Stevenson A for the report back to plenary and general discussion.

Group#1 – Report to Plenary

1. Climate change evidence: compelling issue. Lots of uncertainty. Information is not correctly used in planning. Many knowledge gaps.
2. Issues in using climate change information in management – information lacks specificity. Maybe not the point of this meeting. It is clear that supply and demand problems are looming with population growth. Layer climate change on that. Climate change not, by itself, today's driver for institutional change.
3. Technological change needed – population and demands for water and energy are going to increase dramatically. Need a huge jump in technology/efficiency.
4. Price signals work – technology is here. High value uses of water will survive.
5. Institutions – top down or bottom-up? Nonregulatory regional forum? Bottom up. State (ID) coaching Lemhi Basin groups (upper salmon basin and local water district).
 - Subregional groups needed – “model watershed approach”
 - Provide a framework, allow locals to do the planning
 - Provide information and resources (a tool kit) (Power Planning Council could do this though, need to include Canada)
 - British Columbia starting with basic education
6. Improve data and models, expand outreach.
7. Do a better job with multiyear climate outlooks (start from ENSO; extend 3-5 years into the future). 3-5 year forecasts would have great utility in the Columbia River basin.
8. Evaluate climate change costs/benefits to power systems over next few decades. Not easy to “price” power in the real world.

Group #2 – Report to Plenary (presented as PowerPoint presentation)

Questions/comments from morning session

- New opportunities arising from climate change

- Competing irrigation/flood management
- High flow: flooding
- Expand flood control criteria (Corps would consider)
- Sub-basin planning, including fish impacts
- Ocean changes and impacts

A. Aspects of concern

- Low flow: irrigation, navigation, water supply, fish
- High flow: flooding

B. Impediments

- Need quantitative information – climate change scenarios somewhat qualitative
- Political resistance to accepting the idea that climate is changing
- We have a lot of time; we can put it off.
- Public is not demanding action in adapting to climate change. Policy reacts.
- Projecting other changes: no one has talked about long-term changes in values (e.g., the rise of environmental concerns in the last 30 years).

C. Policy lists – What to add

- Columbia Basin treaty rights;
- Other tribal treaty rights;
- Synergies of demand-side management (energy and water);
- Growth management planning;
- Forest resources: add rangelands, fire;
- Water quality, TMDL (total maximum daily load);
- Air quality planning

D. What could we [CIG] do differently?

- Next meeting: Could have more industrial users here. Targeted papers could be helpful.
- Fact sheet/elaboration of 17 points
- More outreach needed to specific audiences.

Group #3 – Report to Plenary

No notes on the report to plenary for Group #3 are available. Major points of discussion in Group 3's breakout session included the following:

- The need for more specificity on impacts and shorter-range forecasting;
- The need to change flood control rule curves;
- The need for more data, more funding for data collection, and better coordination of data collection/accessibility;
- The need to fold climate change concerns into other planning and monitoring efforts;
- The need for support for climate change planning “from the top” (at the federal level). The administration needs to be convinced and Congress needs to provide resources.
- Potential triggers for change (in willingness to incorporate climate change into planning).

At-Large Discussion

Time was left at the end of the report to plenary for general discussion of the issues raised in the morning and afternoon sessions. Tom Fitzimmons raised a general question for the group to consider: what is the definition of the problem we [meeting participants and CIG] are dealing with? Climate change or sustainability? Is the problem better defined in terms of consumption? Sustainability might be a better definition of the problem we are trying to address. There was little discussion of this point.

Participants were asked to consider whether a second meeting on climate and water policy was needed, what would be discussed at a second meeting, and where the meeting should be held. The meeting adjourned for the evening at 5:15.

TUESDAY, JULY 17, 2001

8:30-11:30

Tuesday morning began with continued discussions in the breakout groups.

Group #1 – Discussion leaders/Note takers: Dennis Lettenmeier, Nate Mantua, Richard Slaughter (same participant list as 7/16)

The second day of discussions for Group #1 primarily focused on factors keeping people from using climate information (addressed in a round table format), monitoring climate change impacts, and issues related to international cooperation and coordination. Major points included the following:

- Many organizations represented in the breakout session are not using climate information in their long term planning for a variety of reasons, including lack of political credibility, access to data, and how to use the data.
- More effective level for taking up climate change adaptation is the grass roots level.
- More education tools/outreach is a high priority.
- Devise protocols for monitoring of watershed scales. Simulation tools are needed for runoff, return flows, stream temp and water quality, groundwater monitoring, and interactions with surface water.
- Need a structure for pulling different pieces of monitoring networks together into a bigger picture aimed at water resources.

Factors Keeping Folks from Using Climate Information

Uncertainty

Jack D.: No access to climate info. Not using it even though they do long-range planning. Would/could use unregulated flow forecasts.

Jim M.: Yakima could use it and is requesting information from the University of Washington and Batelle; adds to the mix of information already used in long term plans.

Gary P.: Colville Tribe does a lot of watershed planning not using climate change information now. Not sure how they incorporate this into the broader mix of information. Planning horizon ranges from 15 to 100 years. Forest products – would like to know more about species distribution, disturbance, applications to intense forest management practices. Instream water quality issues still large. Requires coordination with Canadians that doesn't now exist (especially with stream temps in Okanogan).

George S.: Seattle P.U.D. has been aware of climate change issues for 4-5 years. It is assessing long-range plans in light of climate change (interties, groundwater, HCP for 50 years, conservation). Seattle P.U.D. has benefited from UW research. They are now entering collaborative study with UW to do more climate change impacts research. Neighboring PUDs not that interested right now.

Angus D.: SCL has pledged “climate neutral” energy future.

Harvey T.: The Canada Geological Service (CGS) is into research more than regulations. There is a strong commitment to incorporating climate change into planning for energy, timber, mining and water. Environment Canada has the lead on water. Natural Resources Canada has the lead on groundwater and other geologic programs. Funded Canada's “Climate Change Action Fund”. Priorities – research projects, case studies, trying to identify knowledge/research gaps, ex: groundwater monitoring.

Gary P.: Monitoring is crucial

Kindy G.: The Conservation Trust is considering climate change, using this qualitatively but not quantitatively. Need more sub-basin/watershed level information. Stewart Cohen's work in the Okanogan is a good model for bringing climate change into planning. On the power side: cranking up efficiency with better turbines. Could use better information on water flow/storage/water management. Still looking for a forum for discussing issues.

Jack C.: The City of Kennewick doesn't look at climate change. The City is working on a 5 year plan focused on drought, ESA and water rights. It's a small organization. Working through a process of collaboration with neighbors to develop a regional water supply, investigating groundwater recharge.

Ron M.: Not much development now in the Bureau of Reclamation. Thinking about climate change but have no quantitative data. Climate change information not used now and not sure where you would use it. One mechanism for incorporating climate change information is “cyclic” planning or adaptive management.

Dennis L.: Problems with watershed scale specificity are clearly resolvable although there will be challenges. Northwest Power Planning Council (NWPPC) sub-basins may be the appropriate scales to start with.

Laird N.: The Idaho State Legislature is focused on the political climate. The political reality in Idaho is such that climate change, as an issue, still lacks credibility. The first order of business is to get political business leadership to accept climate change science as credible. Idaho senators

recently shifted positions to line up behind climate change. Need for outreach/education to continue.

Karen F.: The Washington State Legislature is still highly divided over the focus on known versus unknown. Policy makers need more education but constituents also need to line up behind these issues (for fish, watershed planning, urban planning). Legislature still highly divided over climate and other resource issues.

Angus D.: The NWPPC was probably more interested in climate change 10 years ago than it is today. It's become much more political in past few years. The NWPPC had a climate risk model 10 years ago. Today, climate issues don't show up even though they've had analytic capacity to deal with this stuff. Could put this stuff in sub-basin planning models. The Bonneville Environmental Foundation (BEF) sees that the region's utilities are putting climate change information into planning and decisions. Surveys suggest that the public supports renewables, BEF sells "green power" contracts and even Idaho Power is jumping into green power contracts.

BPA has 300 MW of wind power, developing another 1000 MW. Institutions closer to citizens are responding more quickly to climate concerns than those agencies more removed from public. The NWPPC is behind this issue, rather than in front of it.

Gary P.: May be more effective to work at grass roots levels. Climate change is such a contentious political issue that leadership is gone at highest levels.

Dave M: The Oregon Department of Fish and Wildlife is not using climate change information at all. Most energy on short term issues. Haven't seen any discussion of climate change impacts on recovery plans. Haven't been given any guidance on climate change from governor's office. More than just salmonids – bull trout, cutthroat, suckers, steelhead. Recovery Planning: has a tool kit. Climate change likely to add another constraint and be a negative. Other long term regional plans do not consider climate change, e.g., Northwest Forest Plan, HCPs, ICBMP.

Monitoring

Broad based education tools/outreach a high priority. Devise protocols for monitoring of watershed scales. Simulation tools are needed for runoff, return flows, stream temp and water quality, groundwater monitoring, and interactions with surface water. Idaho groundwater monitoring pretty good in Idaho. USGS stream gage network not in great shape, actually losing stations due to budget cuts. Similar problems in Canada.

Monitoring requires long-term commitment, careful documentation.

Improved monitoring has immediate application to management as well as climate information, regardless of climate change. Need a structure for pulling different pieces of monitoring networks together into a bigger picture aimed at water resources. Political reality for agencies is that they don't get long term commitments.

The USGS is trying to develop a more comprehensive monitoring system but their mission has recently changed to service for other federal agencies.

International Cooperation/Coordination

Kindy G.: Working on creating a process for collaboration. There has been some success with BC Hydro; no success with transboundary councils. TMT a closed group. Issues include changing reservoir operations, changing hydropower ops. Important for both long term planning and operations. Next Columbia River Basin Treaty will be much more open.

Formerly NWPPC and BCPPC did similar things but never really linked up and BCPPC folded. Now have a cross-border climate coalition (NGO) with reps from 4 U.S. states and B.C..

Transboundary Dissolved Gas Group. Proposals now calling for opening up Columbia River basin councils (e.g., NWPPC) to Canadian reps but still early in the process. Other aspects of climate change research need to be brought into education/outreach process

(end of notes for Group #1, Day 2)

Group #2 – Discussion leaders/Note Takers: Richard Palmer, Philip Mote, Don Reading, Lara Whitely Binder (same participant list as 7/16)

The second day of discussions for Group #2 primarily focused on general data collection needs, incorporating climate change into long-range planning, and the role of the CIG in the adaptation process. More specific points include the following:

- There are lots of data being collected and lots of states interested in incorporating climate change but the effort is fragmented. There is a greater need for coordination.
- To increase chances for securing federal funding for monitoring, explain the need for the monitoring funds in terms of short-term needs. Do not tell Congress you need the monitoring to track long-term changes over the next 50 years (for example). It is hard to get Congress to impose financial restrictions on future Congresses.
- Given the 2001 drought, now is a very good time to push climate change discussions.
- Work from the bottom up. Keep the politicians out of the detail work.
- Going from agency to agency to discuss climate change is good but a general forum is better. We need a series of meetings in Washington to help.
- The CIG needs to do more in a catalyst role. People are looking for guidance. We should have a regular forum to keep things moving forward.

Lee F.: There is awareness at the policy level. A bill was put into the Washington State Legislature. Farmers are getting involved. How do we regionalize it [climate change]? There are people thinking about climate change in the legislature.

Blair H.: The Northwest Council on Climate Change is a volunteer, unfunded non-profit organization. Wrote a report with contingency planning. Mitigation portion was removed, climate center passed Washington Senate (26-20). The House did not act? What are key vulnerable sectors? They would be encouraged to include it in their planning.

Growth management planning is very comprehensive and could be expanded to include climate change. If it is made a requirement, it may not really be addresses, so you need some level of

review.

What would you have the managers do? Emergency managers are right on top of things, they are used to this. They just change their parameters.

Who funds the CIG? The National Oceanic and Atmospheric Administration (NOAA). NOAA can talk about adapting to climate change but not mitigating it.

Alexandra S.: Part of fish recovery plan is working with the NWPPC, National Marine Fisheries Service (NMFS), and NOAA; supposed to be developing a list of criteria for how to do sub-basin planning and building data systems.

Lee F.: mentioning the Washington Department of Ecology's Section 2014 Watershed Planning Program and watershed planning groups. Focused planning for water quantity issues (required) and water quality (optional).

Lara W.B.: briefly mentioned proposed masters degree project on facilitating the inclusion of climate change information in the Watershed Planning Program.

Larry M.: For I90, one way to incorporate climate change is through cumulative impacts.

Phil M.: What is the best way to get climate change into the planning process?

Blair H.: State transportation was interested in climate change. Believes they are incorporating.

Jeff A.: Climate change is becoming an important issue now in the U.S. Senate. Senator Jim Jeffords, the (relatively) new head of the Senate Environment and Public Works Committee, has stated that climate change is the most important issue for his committee.

Fish and Wildlife program Environmental Impact Statement – not sure if climate change is part of the analysis.

Larry M.: State level may be a good level to attack and/or the municipal level. Could amend SEPA.

Lee F.: There is a need for a climate center, a central place to get data.

Stan F.: Need to start at the top and at the bottom to work to the middle.

Don R.: There are many differences between the states. The needs of different states are quite difference.

Making information available is extremely valuable.
Water are the economic possibilities to help people adapt.

Lee F.: Do you feel that the information already exists?

There is enough data but there is a need for a wakeup call.

It is not difficult to integrate some of this information.

Stan F.: Finding data can be very difficult. It is useful to have it organized in a convenient way.

Jim B.: There is lots of data being collected and lots of states interested in incorporating climate change but the effort is fragmented. There is a greater need for coordination.

Stan F.: The collection system is sometimes at risk. We are losing data collection sites due to cuts in funding.

Phil M.: We need to continue to make measurements.

Jeff A.: To get federal funding, couple the data funding needs with short-term needs. Do not tell Congress you need the monitoring to track long-term changes over the next 50 years (for example). It is hard to get Congress to impose financial restrictions on future Congresses.

Can we attach climate change into salmon recovery? Again, the idea is the same as yesterday, tying issues together. Salmon issue will be around for a very long time.

A \$668 million bill was put into salmon recovery but nothing was in it for climate change.

Harold B.: We know what needs to be done. It is a question of how to get people to listen. There are no representatives from EPA. It is good that we are tackling the problem. Seem similar to the Columbia River – it is there for all, not single groups. Salmon recovery is one issue, clean water is another. Some religions use holy water – to us [native people] all is holy and we need to think about what we are leaving for our children and grandchildren. It is going to require changes now to make a positive change in future generations. What we do to Mother Earth we do to ourselves.

Blair H.: The UW is in the information business but information by itself is not that useful. The process is very unimportant. Why are people not talking about the interactions between fish and climate? Information needs to get to where it needs to go.

What more information do we know? We need to bring the policy people together and talk about process. We need to define adaptive process and incorporate the information that they have. The research agenda cannot be in conflict with people's real needs.

Phil M.: We have briefed water resource engineers on how to use forecasts. What we want to do is have policy level discussions. We will make appointments with whomever wants to talk to us. We do not make policy.

Blair H.: The piece that's been missing is bringing people together and dealing with the process. We need a meeting about process.

Lee F.: The timing for discussing climate change could not be better, with this year's drought.

Phil M.: How do we do it?

Lee F.: Going from agency to agency is good but a forum is better. We are spending hundreds of millions of dollars on planning and now is a good time. We need a series of meetings in Washington to help.

Blair H.: Possibly something similar to Governor Locke's (WA) Blue Ribbon Commission on Transportation.

Lee F.: What you want from me is unclear. What do you really want us to do? Are we here to take this information back to our agency?

Paul C.: Impacts are based on local conditions. We could help refine this and help people see what the impacts are.

Stan F.: What is being done is fine but it cannot be done all at once and it will take time. The message needs to get to people from various sources. It is going to take several years.

Lee F.: You told me some science but you are having problems here. Are you going to put together policy forums?

Lara W.B.: The purpose of this meeting was to talk about policy implications in their agencies. This has been a learning process for the CIG group. The region is not ready to take hold of this issue and we need to find ways to get these issues before a larger audience.

David G.: The CIG needs to do more in a catalyst role. People are looking for guidance. We should have a regular forum to keep things moving forward.

Larry M.: Policy can originate at various levels. In this case we are going bottom-up. Keep politicians out of the detail work. Things need to coalesce at the planner level.

Jeff A.: There is a limited amount of attention so the messages have to be clear.

Phil M.: Canada is spending much more on adapting to the U.S.

Wayne L.: Is the problem large enough to make them scared or respect the problem?

Alexandra S.: Lots of new plants are coming on line. What are the cumulative impacts? No one was interested. A lot of policy is being made by Seattle law firms. They were not interested in having emissions from new plants examined. Although people are interested in reliability, all the impacts are not being investigated. Getting people to conserve energy is still difficult. Many people want to be on the moral high ground but current political realities suggest that not much action will actually be taken. The adaptive strategies are important because people do not want to address limiting emissions.

Jim B.: The group [CIG] needs to work in between meetings to carry their message.

(end of notes for Group #2, Day 2)

Group #3 – Discussion Leaders/Note takers: Edward Miles, Alan Hamlet, Amy Snover, Stewart Cohen (same participant list as 7/16)

The second day of discussions for Group #3 primarily focused on approaches to designing a strategic response to climate change, levels of action (federal, state, local), climate data/monitoring needs, and coordination of U.S. and Canadian monitoring/research. Major points included:

- More education/outreach needed.
- There is a need to work not only from the local level but top down as well to reverse the existing political momentum.
- Glacier monitoring is a missing piece of data that would be useful as a tool for tracking regional warming.
- The “oncoming truck” analogy in relation to putting a priority on a monitoring system. Suppose we are standing in the middle of the road, and a truck is approaching. Efforts to better estimate the speed of the truck are of little help if there is no capacity to move out of the way. In the context of climate change, right now we have no ability to get out of the way. This needs to be addressed.
- Coordinated studies combining the efforts of researchers and managers across the U.S./Canada boundary are needed.

Q: Given that climate change was agreed to be an important issue, what would you do and how would you approach the problem of designing a strategic response?

Nancy S.: Six year planning horizon, 1 year time step (BPA). The modeling capability is there and we can run scenarios through the planning process. A much more difficult task is to create a consensus that the results are believable and important, and thereby to actually influence policy. Would present modeling results to next level up then chain of command would take over. If other agencies also believed it, would lead to discussions, re: patterns of reservation operations – flood control, fish, etc. Coordinate discussion with other agencies (network).

Nancy G.: Seattle City Light's Policy Board has already made climate change a priority. E.g. has charged City Light to meet load requirements without increasing greenhouse gasses. Focus points are needed. Relicensing of Boundary Dam may provide an opportunity. Need to get the right people and interests at the table. Watershed councils may be a pathway. E.g. Skagit watershed council. Introduce climate change information into these existing organizations.

Tom F.: Need to create the motivation to act now, but for the long term. Bring the various municipalities together. Then funnel down to the key policy issues.

Johnny C.: Already broad recognition that climate change is important in Vancouver but there is not yet a clear recognition on how to tie into policy. Short-term/long-term. Public conferences important; coordination with municipalities.

Scott P.: One approach would be to work up through the layers from the bottom. Awareness of the problem is there now. NRCS could work with other agencies. One problem is that NRCS can provide information but does not have any water management authority. Education would

be a good objective. E.g, approach and provide information to conservation districts. Then work this process up through the policy chain from the bottom. The next level up is another technical group, then comes the USDA.

Barry N.: Yes, but there is also a need to work top down as well to reverse the existing political momentum.

Ed M.: The obvious top down approach would be to use the White House, however using the White House is not a route available to us at this time. How to stimulate forward motion in the face of an antagonistic environment is the problem. Exploring bottom up may be only feasible approach at this time.

Kyle M.: What about using the democratic elements in Congress rather than the White House as the point of focus?

If a top down approach is not possible now, use regional/national work with Congressional staff.

All Federal agencies would face similar problems.

Steve M.: Republicans also are supportive of certain kinds of restoration efforts and are eager to provide the appearance of doing better on environmental/climate issues. This may present an opportunity. There are potential implications for the current Farm Bill before Congress, for example.

Potential leadership from states? If 1 major state like CA would move. Build easy to use data sets with climate story. Wide distribution. Decision support tools of relevance required. Distribute as software of CD.

Nancy G.: Education about the existing interrelationships between different water uses and water management jurisdictions in individual river basins is a missing piece. An appreciation of limiting constraints and interconnections between different use of water needs to be promoted.

Chad D.: About 5% of funding is coming from Federal government. An approach that might be useful given a federal reluctance to create appropriate policy is to let one individual state take the lead. Leadership will transfer the approach and methods across the nation if the attempt is successful.

Pat M.: Maybe this avenue of approach [political/official policy response] is the wrong one to take. If it's easy to gain access to appropriate scenarios, then my feeling is that they will be used. Climate change becomes a "leverage point" for special interests trying to influence planning, which brings climate change information into the planning process. Easy access to data could facilitate this.

Tom F.: Have seen this mechanism at work in recent task force meetings. The objective of the task force was to gather perspectives from across the region. Initial "disbelievers" regarding climate change were "converted" based on self-interest, but converted nonetheless. Climate change was eventually seen to be an ally in the quest to build new storage projects.

Q: Given the lack of coordinated Federal oversight, how to we construct an institutional whole that is greater than the parts?

Scott P.: This has been an issue and point of discussion for years. Very little outcome from past efforts. Redundancy of climate monitoring has been improved somewhat, although not necessarily due to planning--more due to budget cuts and resulting attrition. E.g. collection of snowpack data used to be done in each agency. Now NRCS does it all. Streamflow collection has now moved primarily to agencies that have the greatest experience.

USGS, NRCS, NOAA, etc. already realigning tasks as budgetary necessities but little progress on major task after 6 interagency meetings.

Barry N.: UCAN (United Climate Action Network (?) sponsored by USGS) is designed to integrate existing information sources. There are committees on groundwater monitoring, streamflow gaging, water quality, etc. Propose a subcommittee on climate change?

Does easy access to data play here too?

EPA RAIN (Rapid Access Info System) looking towards doing this for water quality, flows, watershed inform from a variety of sources.

Tom F.: Rapid access information systems are a similar tool, but with a different focus. Rather than laboriously attempting to create comprehensive monitoring plans, they created their own database from available sources on the web. There are problems with quality control, different sources, etc, but access is much more uniform as a result of the effort. This is an example of a bottom up rather than top down approach.

Scott P.: Other regional databases and information systems exist, and so there is redundancy here as well.

Is there redundancy or illusion of redundancy? Web pages indicate redundancy but data sources not redundant.

Pat M.: To some extent there is the illusion of redundancy in existing monitoring systems, but in fact there is a dearth of funding to produce the data, and relatively few organizations are putting information out there. Information is recycled through the various agencies. One stop shopping would be nice, but the information is out there now if you know where to look for it.

Kyle M.: Glacier monitoring is a missing piece that would be useful as a tool for tracking regional warming. Mobile GPS systems to measure glacier mass balance have been developed, and would provide an inexpensive source of data for glacier monitoring.

Johnny C.: Need to be much more clear about why we need to monitor. The problem is not technical, but political and social. The danger is that the technical side will continue to be the focus without a policy input. Is a monitoring system required if policy input pathways are missing?

Ed M.: Yes a policy input pathway is required, but existing climate monitoring systems have too

many gaps. Monitoring is an important element in creating societal response capability especially considering the potentially rapid rates of change involved.

Johnny C.: I can buy into that, however I still question the priority of a monitoring system. To give an analogy, suppose we are standing in the middle of the road, and a truck is approaching. Efforts to better estimate the speed of the truck are of little help if there is no capacity to move out of the way. In the context of climate change, right now we have no ability to get out of the way. This needs to be addressed.

Tom F.: What are the technical needs? A determination of specific data requirements could be compiled.

Suggest bringing all agencies together to deal with gaps for modeling/forecasting needs (would be useful).

Nancy S.: Data requirements are specific to local needs. Climate change met stations would help to resolve the confusion about quality of data. Monitoring of ocean conditions would also be valuable, e.g. instrument the North Pacific. Validation of climate scenarios.

Ed S.: A climate observing system is essential. We don't have the ability to monitor global average temperature plus or minus 0.2 C, which is pathetic in this day and age. A proper climate observing system would allow you to make yearly decisions based on the observed conditions in the evolving climate system.

Design network of stations precisely for climate change. Need observation systems. Key is to produce useful tools to be used on daily basis.

Steve K.: With regard to the restoration of Pacific Salmon. What data and tools do we need to get out of the way of the climate "truck"? There is an awareness that the truck is on the road, but little work has been done to assess what tools are needed.

Tom F.: There is a continual tension between the need to make decisions on the short term in a professional context, and the need for use of data and management decisions that are applicable to the longer-term issues such as climate change. Data is used to support existing agendas, but the longer term needs more thought. Put scenarios out there without apology for uncertainties.

Chad D.: Detailed studies of individual basins incorporating all uses of water are important. Yakima study?

Ed M.: The CIG is doing this, but the Snake River is the focus instead.

Measuring of technical assessments missing. CIG needs to make that clear. Take smaller area and do intersectoral sweep for effects.

Stewart C.: It makes sense to construct a collaboration between researchers and managers, an interdisciplinary approach that can ultimately take you beyond the confines of the existing studies. Take a hydrograph to managers. Their response is based on experience, not the explicit consideration of scenarios. Use experience of managers and monitoring tools to define ongoing

needs. Dialogue based on experience and decision support systems at the same time. The success of the Great Lakes experience supports this approach to inter-basin planning.

Q: What needs to be done to create a coordinated response between U.S. and Canada?

Stewart C.: Coordinated studies combining the efforts of researchers and managers across the boundary are needed. Problems of institutional design cannot be addressed by one side or the other alone.

Alan H.: I think it has to be a top down approach with regard to international transboundary issues. Otherwise the fundamental differences in management objectives is likely to introduce conflicts between adaptive strategies themselves. E.g., fish management in Canada and the US-- Canada wants to keep reservoirs full in summer to protect lake ecosystems, the U.S. wants instream flow for salmon in summer which would benefit from release of Canadian storage. Without identifying win-win management alternatives, conflict will not be resolved.

Steve K.: Coordination councils exist and could be informed by climate change information. E.g., Puget Sound Action Team, Transboundary Gas Group (Columbia basin), at a very broad scale the EPA. Such a framework could be expanded to address flow issues as well. Have to make a choice about how to look at climate change issues. [Post-meeting note from Alan Hamlet - The Transboundary Gas Group was, I believe, formed at the Columbia Basin Ecosystem Management Conference in Castlegar, BC in 1998. The Columbia Basin Ecosystem Management outreach effort might therefore be used to help create other such groups. Stewart Cohen and I gave presentations on climate change, but my impression was that it wasn't much on the radar screen at that time. Only a few people saw that it was important.]

Front-end coordination necessary. As model, US/Canada cross-boundary dialogue on water quality. Cities – Seattle/Vancouver, Governor WA/Premier B.C.

Stewart C.: It isn't necessarily the case that new institutions need to be created. The Great Lakes effort did not invent new institutions, for example. Need to identify existing institutions or planning mechanisms that can usefully incorporate climate change information.

Pat M.: Why don't you go to the Operating Committee of the Columbia River Treaty? It doesn't seem that hard to do that.

Nancy S.: Better to go with Northwest Power Planning Council (NWPPC). Operating Committee focused on operations, and is relatively inflexible. Difficult to manipulate the treaty. Many constraints. Furthermore, in our experience, nothing from Canada is free.

Pat M.: The best way to approach the Operating Committee is off the record. You go in before the official meeting. They hear your spiel, they send you away. The official closed door meeting starts.

(end of notes for Group #3, Day 2)

Report Back to Plenary and At-Large Discussion – Tuesday, July 17

10:00-12:00

Groups reconvened for final report to plenary and general discussion.

Group #1 – Report to Plenary

- Information is not used in a definitive way. Climate change is not currently deemed to be a critical issue, in part because of issues with time horizon. Professional timescales vs. timescale of physical changes. As a result, the political support for considering these issues is lacking.

[Additional comments by Dennis L.: Despite this there has been a shift since 1997 meeting from an initial awareness of the problem towards a focus on what to do given that the problem seems likely to occur.]

- Need for further education and forums like this one. Need to get the public involved at a grass roots level. Further education of upper level policy and decision makers.
- Broaden the scope of the issue to include other impacts such as forests and fish.
- Frustration about accuracy and uncertainty in scenarios. Data needs and monitoring processes should be evaluated. Researchers need better data to improve the accuracy of climate predictions, and practitioners need better tools/data for management.
- Changes in data services, reductions in funding and access to data works against appropriately including climate change information in policy.
- Lack of coordination. How best to collect, analyze and distribute data.
- Groundwater is a crucial missing piece.
- Better communication/coordination between subregional groups is needed, which is a complex organizational task. Some important decision processes are closed.

Group #2 – Report to Plenary

Monitoring:

- Lots of data already available; better coordination needed
- One centralized source would be useful
- Unified Climate Action Network (USGS) that is on the way is a step towards that.
- Long-term monitoring capability is at risk because of potential loss of stations. Need to make Congress aware of the need to couple long-term and short-term needs.

Strategies:

- What was the intention of the Skamania meeting? It was not as clear as it could have been.
- Climate change has to be integrated with other issues: ESA, salmon recovery, energy production, local watershed planning.
- Top-down vs bottom up? Both! Use the open doors. More interaction with planners and career policy people (not elected officials), bring politicians in later.
- Lots of legal avenues for adapting to climate change: e.g. change water law from the bottom up
- Sub-basin planning, technical recovery teams
- Timing of the 2001 drought is useful: need more briefings, meetings

- CIG in good position to serve as a catalyst.

Group #3 – Report to Plenary

- Need to involve key policy people, in conjunction with public outreach. A "bottom up" approach may be the most practical avenue available in the short term.
- Implementation of climate change scenarios may best be realized by creating data sets that can be used in an “off the shelf” manner for planning.
- We don’t have a policy framework for using the technical information, so it’s no help as it stands. Better data is needed to create the policy support needed. Glacier monitoring was mentioned as a missing piece.
 - Truck coming down the road analogy. “Suppose we are standing in the middle of the road, and a truck is approaching. Efforts to better estimate the speed of the truck are of little help if there is no capacity to move out of the way. In the context of climate change, right now we have no ability to get out of the way [i.e., no real tools to improve water management]. This needs to be addressed.”
- Good planning and coordination is taking place at some levels, but the need for more comprehensive understanding of the interactions between various management groups and water uses is essential.

Final Question for the General Plenary Session:

How do we improve flexibility or increase our ability to manage our water resources, including climate change as one of a range of stresses?

Context for the question - Climate change is not a priority issue but problems in water management system are. Problems include:

- Demand outstripping supply
- Conflicts between uses (suit against BPA, re: salmon)
- Policy environment more difficult. Trade-off conflicts sharper (hydro/fish/agriculture; M&I uses/hydro/fish).
- Rigidities in institutional arrangements (e.g. municipal transfers)
- Flexibility in prior appropriation?

Tom Fitzimmons suggested rephrasing of the question to put a more positive spin on it. Tom’s rephrasing of the question:

“How do we improve the capacity of the region’s water resources and management system to address all demands on resources and the management system”

Karl Dreher raised the point that Idaho’s experience with water banks shows that there is flexibility in the Prior Appropriation Doctrine. The ESA and the Clean Water Act are the two primary impediments limiting flexibility. Karl also noted that CIG could help answer the question just posed, and recommended that CIG do workshops on state/regional basis aimed at politicians and science educators (specifically mentioned Project WET [Water Education for Teachers]). Politicians must be engaged. However, term limits with legislators are a problem; continually having to reeducate people.

Before decisions are made that require investing, uncertainty has to be narrowed.

There was strong support for having a second Climate and Water Policy meeting within the next six months (approximately). Karen Fraser recommended having another meeting before the next session of the Washington State legislature (session begins January 2002). The CIG is willing to host another meeting and will begin planning for the event.

The meeting adjourned at 11:30 am.

----- end of meeting ----

CLIMATE AND WATER POLICY MEETING, July 16-17, 2001
Summary of Comments From Evaluation Form (as of 8/2/01)

The following reflects comments received to date on the evaluation form for the July 16-17, 2001 Climate and Water Policy meeting at Skamania Lodge in Stevenson, Washington. Twenty-two responses have been received as of **8/2/01** (see end of document for list of respondents).

General Summary

All respondents found the meeting beneficial. Respondents found the information presented in the Monday morning session interesting and informational. There were a number of comments regarding the benefit of hearing and interacting with such a diverse group of participants and perspectives. The meeting provided an opportunity for people to make key contacts. It was a “great starting point” according to one respondent.

Some participants wanted to see presentations/discussion on climate impacts on other areas, such as forests, coasts, and dryland agriculture. Many respondents expressed a need for better facilitation and a more defined sense of purpose for the breakout sessions. One respondent also suggested rotating members of the breakout groups to get more diverse points of view.

Nearly all respondents stated that they foresee using climate information in their organization’s programs at some level at some point in time. A few already are using it; many others consider it a possibility. Several respondents commented on the need for more detailed information on drainage, watershed, or sub-basin levels as a means of facilitating the use of climate information. Only 2 of 20 respondents said “no” to using climate information in their organization’s programs. In those cases, the scale/accuracy of the information and the need for leadership from the state level (Governors) were provided as explanations.

When asked what types of planning efforts could benefit from climate information, answers generally fell into one of six categories: hydro, flood control, water supply/use management, ESA consultation and planning, agriculture, and other (see “Responses by Question” for a more detailed listing of program areas). Making more accurate predictions in the 1-5 year range on a local scale (individual watersheds and reservoir operations) was also suggested.

Respondents provided a diverse list of topics for future meetings. In general, responses fell into one of five categories: policy aspects, data/monitoring aspects, simulations/case studies, education/outreach, and other. Respondents also provided a long list of recommendations for moving climate information into the public policy sector. Recommendations could be grouped as education/outreach, piggybacking climate change, scaling impacts, technical recommendations, and general recommendations. Many respondents recommended continuing this type of meeting for policy makers as a forum for discussion and education. Perhaps the most significant (but not unexpected) messages of the meeting were the scaling issues (bringing climate information down to the sub-basin level) and the need to piggyback climate change information with other broader policy issues. By itself, climate change impacts are too distant in many policy/organization time frames to capture attention and funding on its own at this time. See “Responses by Question” for specific recommendations.

Responses by Question

Please note that the following responses were taken directly from the evaluation forms.

1. Did you find this meeting beneficial? yes no
If yes, what was most beneficial? If no, how would you suggest doing things different in the next meeting?

All respondents found the meeting beneficial. Additional comments:

- Most beneficial
 - Interacting with the wide variety of perspectives, both policy and technical sides.
 - Key contacts made
 - Learning about the current state of climate change impacts in the PNW
 - Raising the awareness of climate change
 - Seeing where all might agree and disagree
 - “Understandable” presentations of technical material.
 - Gov. Evans talk
 - A great starting point flesh out all concerns and begin narrowing the scope and capabilities of this group
- Things to do different in the next meeting
 - Although the purpose of the meeting was to help determine next steps, it would have been useful to begin the plenary sessions “with the end in mind...”, ala Stephan Covy’s 7 Habits...
 - Little direction or structure in the brainstorming sessions; breakout sessions need to be more structured.
 - Hire professional facilitators for breakout session; provide better moderators. Moderator was unfocused and allowed group to wander.
 - Focus on objectives/outputs before going to breakout sessions
 - Breakouts might have been more productive if membership rotated each day to get more diverse points of view.
 - Include dissenters on program.
 - Determine what organizations that were not represented (e.g., EPA²) and ensure that they come next time. More focus on topics for discussion and expected outcomes for the second day.

2. Do you foresee being able to incorporate climate information (including climate change scenarios, seasonal forecasts, and long-term past climate records) into your organization’s programs and concerns? If no, why not?

- Several “Yes” responses with no explanation.
- Yes, but for now only to the extent of considering “what-if” scenarios. In that regard, what would be most useful would be projected unregulated streamflows for individual or groupings of hydrologic basins (note: comment from Karl Dreher, Director of the ID Department of Water Resources).

² Acting Deputy Regional Administrator Ron Kreizenbeck from USEPA Region X had planned to attend the meeting but had to cancel on June 8 due to a conflict. No alternate was designated.

- Yes – but need more detailed information on drainage or watershed or sub-basin, especially snowpack.
- Yes – impact to salmon recovery efforts will be considered.
- Yes – we (the Fraser Basin Council) are convening a symposium on climate change in the lower part of our Basin in November to determine how to do this and extend it through the entire basin in the near future.
- Yes – in future research initiatives climate change will become a major focus.
- At the City of Yakima, possible. Can start to include climate considerations in LT plans (e.g. capital facilities plans). In USDOT, yes via cumulative effects analysis in EIS (at project level; not sure at the state level)
- Yes, if it easy to do and is applicable to the problem at hand.
- Yes, eventually
- Yes, quite able – I’d like to make sure we continue dialogue on this.
- Use as another factor to encourage more action on new water storage and enhanced conservation/efficiency efforts.
- Yes, we do now (NRCS) and will continue to use seasonal and long term information. Climate change info will begin to be used.
- Technically yes but organizational focus emphasizes the near term (BC Hydro)
- To a certain extent but what would be most useful is modeling that can help with salmon run-size predictions especially as it relates to ocean survival.
- No – Not at a scale and accuracy that is usable to us for forecasting.
- No. Leadership needs to come from the state level, e.g., Governor’s leadership level.

3. *Take a moment to consider the various planning and management responsibilities within your organization. Please identify three water resource planning or management responsibilities that would benefit from the climate information presented at this meeting. How could the information be made more specific (e.g. localized) to meet these planning needs?*

- *Hydro*
 - Further hydro modeling
 - Hydro pool management
- *Flood control*
 - Altered modernized flood control – more specific discussions with COE, BOR, and BC Hydro
 - Flood hazard management
- *Water Supply/Use Management*
 - River management
 - Water use planning
 - Stormwater and wastewater planning, municipal water supply planning
 - Long-range supply and demand forecasting and strategic planning (at the utility level)
 - Predicting potential for water for irrigation, fish, etc.
 - Allocating water
 - Cedar River Watershed
 - Relicensing Boundary Dam
 - Storage project development and management
 - Conservation/efficiency planning

- Mainstem operations
 - Water quality implementations - §303d list , temp listing, and TMDLs (total maximum daily loads)
 - Minimum flows: how to set and achieve
 - Bounding scenarios for long-range river basin planning
 - Development of new integrated rule curves for reservoir operation
 - Considerations of mitigation strategies for out-of-priority diversions under junior priority water rights.
- *ESA consultation and planning*
 - Evaluating vulnerabilities of fish management and recovery strategies.
 - Upper Snake FCRPS Biop (long range impacts of Res Ops on fish and irrigation)
 - Rogue Biop (long range impact of Res Ops on fish and irrigation)
 - Species/ecosystem restoration/conservation/recovery.
 - *Agriculture*
 - On farm conservation planning and watershed resource planning. This information could be used for irrigation efficiency, pest management, and crop rotation planning (changes in growing season dates is an example).
 - *Other*
 - Impacts on forest lands, species impacts, etc.
 - Air quality characterization
 - Long term transportation planning (USDOT)
 - Land management (Seattle's 140,000+ acres in the Cedar/Tolt watersheds)
 - Growth Management Act planning. The problem is that salmon recovery groups and water planning groups are forms and operate fairly independent of and without regard to land use planning even though GMA requires it.

With regards to making the information for specific, one respondent suggested that more accurate predictions in the 1-5 year range on a local scale would be useful. Include impacts on individual watersheds and reservoir operations.

4. *What topics would you like to see the next meeting address?*

- *Policy Aspects*
 - Short term policy actions to help policy makers begin to integrate climate change into short and long terms planning initiatives but you need a short, concise single white paper providing some suggested action.
 - Initial development of policy alternatives to present to legislators
 - Discussion of long term political strategy: should we pursue changes at the local, state, or federal level or some combination of the three
 - Framework for dealing with this as a regional issue – develop a charter document.
 - Specifics from various agencies and entities on implementation of climate change information
 - Continue to explore how to get climate change into policy
- *Data/Monitoring (Technical Aspects)*

- Results of reservoir models, flood control and fish models that have as input both historic and modified (for climate change) flow (i.e., will salmon go extinct , will reservoirs fail to refill).
 - What data is available to incorporate into planning/operating models
 - What kind of monitoring network should be developed?
 - How to adjust period of record to be more accurate in forecasting future hydrographs
 - Modeling impacts on tributaries; shift of flow pattern
 - Water quality and temperature implications/minimum flows
 - Breakout sessions for product development and data collection to address inter-agency needs.
 - Workshop for technical people (not policy people) on using and incorporating climate change information in hydrologic modeling
 - Need monitoring criteria protocol for the Columbia Basin; better flow forecasting.
 - Need more accurate forecasting in the 1-5 year range.
- *Simulations/Case Studies/Other Assessments*
 - Perhaps a simulation exercise or planning exercise for how climate forecasts would be incorporated.
 - Case studies of how climate change might affect specific resources/sub-basins
 - Columbia Basin organization model
 - Regionalized assessments – prepare regionalized assessments, e.g., coast, Willamette Basin, Deschutes Basin, Eastern and Southern Oregon to show variation of water type (snow based, rain based) and effects.
 - Focus on a specific, small area; all effects of climate change should be explored in a small basin – energy, flooding, navigation, M&I uses, recreation, tourism, fish and wildlife
- *Education/Outreach*
 - Education strategy for: managers/agencies, policy makers, general public
 - Creating more adaptive tools to address the energy issues
 - Tools for outreach
- *Other*
 - Specific impacts on various sectors – fish, power, agriculture, etc. Solicit speakers?
 - Role of greenhouse gas vs. adaptive strategies
 - Integrate land use planning with global warning and water use and demand.

5. *Based on your own experiences, what recommendations do you have regarding moving climate information into the public policy sector?*

- *Education/Outreach*
 - Develop broad-based public outreach
 - Policy education of regional congressional staff and state natural resource agency staff
 - Develop a coordinated mechanism to publish factual and up-to-date information in an integrated manner.
 - Continue this type of workshop for politicians/decision makers/policy makers
 - Availability of information is critical to action/planning regarding climate change
 - Continue to hold meeting and begin more focus at specific sectors

- More of these kinds of meetings. Media → public → public policy makers.
 - Two prongs: 1) education to public, elected officials; 2) leadership forum to create governess in general in regional natural resource issues and specifically climate change.
 - Work with educators
 - Package for the media
 - Engage the tribes for creative solutions on reservations
- *Piggybacking Climate Change*
 - Don't exaggerate or alarm – it will backfire (emphasis from original comment). “Climate change” needs to be associated with management of resources. As a stand-alone issue it will not compete for dollars and attention of resource managers/politicians.
 - Tie it to broader policy issues (e.g. sustainability, transportation, etc.)
 - Don't see climate change as incorporated as an end in itself. See part of broader picture. Need to elevate this to key BC/regional policy leaders to give direction to...get on with solutions to broader issue of sustainability, not just climate change.
- *Scaling Impacts*
 - Make it easy to transform historic flows into flows modified by climate change. We need this for basins smaller than the Columbia. For example, Rogue, Deschutes, Tualitin, Crooked, etc. If it is easy, get a modified flow set then people will use it.
 - Message needs to be relevant to individual situations, e.g. how will it affect my income, safety, recreation – my quality of life.
 - Identify sociological and economic impacts to target specific public entities.
 - It would be helpful for CIG to conduct workshops on no smaller than a state-wide basis for politicians and science educators.
 - Show through an example what the implications are from climate change. You must attract the attention of a broad cross-section of society that will, in turn, get the politicians attention
- *Technical Recommendations*
 - Better process models, monitoring stations (precip and water supply), more education on the subject needed
 - Incorporate bounding scenarios of climate change into sub-basin planning being done or facilitated by the Northwest Power Planning Council.
- *General Recommendations*
 - The technology and methods available can be very instrumental in the goals that are within reach. Make a model that has data and make a checklist of things that need to be done. Check them off over time. One of the first things we need is clean water (emphasis from original comment). Once that is checked off everything else should follow suit.
 - There needs to be robust means developed to facilitate universities serving public sector needs for information - both by generating regular/process policy dialogues and trust, and serving operationally requirements for information, perhaps through the private sector (e.g. consulting firms) under contract or other partners with operational capabilities. Take advantage of triggering events.
 - Using the three-layer cake metaphor with legislators at the top, planning/policy advisors in the middle and researchers at the base...I think our ideas need to coalesce

and congeal within the lower two layers prior to presenting policy alternatives to lawmakers.

Evaluation Form Respondents

- Paul Cleary, Director, Oregon Water Resources Department
- Karl Dreher, Director, Idaho Department of Water Resources
- Kyle Martin, Mainstem Hydrologist, CRITFC
- Gary Passmore, Director of the Environmental Trust, Confederated Tribes of the Colville Reservation
- David Marshall, Executive Director, Fraser Basin Council
- Chad Day, Professor, Simon Fraser University
- Doug Smith, Resource Planning Specialist, BC Hydro
- Justin Gould, Nez Perce Tribe
- Larry Mattson, Council Member, City of Yakima
- George Schneider, Water Resource Manager, Resource Management Branch, Seattle Public Utilities
- Harold Blackwolf, Sr., Confederated Tribes of the Warm Springs Reservation
- Ron McKown, ESA Program Manager, U.S. Bureau of Reclamation
- Josh Foster, Senior Program Development Specialist, Office of Global Programs, National Oceanic and Atmospheric Administration
- Kindy Gosal, Community Liaison for the Environment Sector, Columbia Basin Trust
- David McAllister, Director, Habitat Division, Oregon Department of Fish and Wildlife
- Nancy Glaser, Director of Strategic Planning, Seattle City Light
- Steve Kellar, Regional Director and Agency Drought Coordinator, Washington Department of Fish and Wildlife
- Scott Pattee, Water Supply Specialist, Snow Survey and Water Supply Forecasting, U.S. Department of Agriculture, NRCS (WA)
- Laird Noh, Chair, Idaho State Senate Resources & Environment Committee

Responses with no name: 3

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- Klamath Basin field, 2001. U.S. Department of Agriculture.
www.or.nrcs.usda.gov/pas/picsdrought.htm
- Skagit River, winter 1996. Photo: Lara McKinnon. Northwest Regional Floodplain Managers Association. www.norfma.org.
- Dworshak Dam, Idaho. Idaho Department of Water Resources.
<http://www.idwr.state.id.us/info/water/dams/Dworshak.htm>

Climate and Water Policy Meeting - July 16-17, 2001, Skamania Lodge

Final Participants (listed by NAME)

Prefix	First Name	Last Name	Title	Organization
Mr.	Brian	Allee	Executive Director	Columbia Basin Fish and Wildlife Authority
Mr.	Jeff	Allen	State Director of the Environment for Senator Mike Crapo (ID)	U.S. Senate
Mr.	Greg	Armour	Secretary of the Board	Okanogan Basin Water Board
Ms.	Cynthia	Barton	District Chief (WA)	U.S. Geological Survey
Mr.	Jim	Barton	Chief, Hydrologic Engineering Branch, North Pacific Region	U.S. Army Corps of Engineers
Mr.	Gustavo	Bisbal	Senior Science and Policy Analyst, Fish and Wildlife Division	Northwest Power Planning Council
Mr.	Harold	Blackwolf, Sr.	Chairman, Fish and Wildlife Committee	Confederated Tribes of the Warm Springs Reservation
Mr.	Brian	Brown	Assistant Regional Administrator, Hydro Programs	National Marine Fisheries Service
Mr.	James	Buizer	Assistant Director, Office of Global Programs	National Oceanic and Atmospheric Administration
Mr.	Johnny	Carline	Chief Administrator	Greater Vancouver Regional District
Mr.	Jack	Clark	Solid Waste/Environmental Engineer	City of Kennewick
Mr.	Paul	Cleary	Director	Oregon Water Resources Department
Dr.	Stewart	Cohen	Adaptation and Impacts Research Group (AIRG), Sustainable Development Research Institute (SDRI)	Environment Canada/University of British Columbia
Mr.	Charles	Craig	Deputy Director	Oregon Department of Agriculture
Ms.	Linda	Crerar	Policy Assistant to the Director	Washington Department of Agriculture
Dr.	Chad	Day	Professor, School of Resource and Environmental Management	Simon Fraser University
Mr.	Karl	Dreher	Director	Idaho Department of Water Resources
Mr.	Angus	Duncan	Executive Director	Bonneville Environmental Foundation
Governor	Daniel	Evans	former Governor and U.S. Senator for Washington	Daniel J. Evans Associates
Mr.	Lee	Faulconer	Policy Assistant to the Director	Washington Department of Agriculture
Mr.	Tom	Fitzsimmons	Director	Washington Department of Ecology
Mr.	Joshua	Foster	Senior Program Development Specialist, Office of Global Programs	National Oceanic and Atmospheric Administration
Mr.	Stan	Fox	Assistant State Conservationist (OR)	U.S. Department of Agriculture, NRCS
The Honorable	Karen	Fraser	Chair	WA Senate Environment, Energy, & Water Comm.
Ms.	Laura	Gephart	Watershed Projects Coordinator	Columbia River Inter-Tribal Fish Commission
Ms.	Nancy	Glaser	Director of Strategic Planning	Seattle City Light
Mr.	David	Goodrich	Director, Climate Observations & Services Office	National Oceanic and Atmospheric Administration
Mr.	Kindy	Gosal	Community Liaison for the Environment Sector	Columbia Basin Trust
Mr.	Justin	Gould		Nez Perce Tribe
Mr.	Alan	Hamlet	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Mr.	Blair	Henry	President	Northwest Council on Climate Change
Mr.	Steve	Johnson	Executive Director	Washington Public Utility District Association
Ms.	Adrienne	Karpov	Program Manager, JISAO/SMA Climate Impacts Group	University of Washington
Mr.	Steve	Keller	Regional Director and Agency Drought Coordinator	Washington Department of Fish and Wildlife
Dr.	Doug	Kenney	Professor, Natural Resources Law Center	University of Colorado, Law School
Mr.	Jeff	King	Senior Resource Analyst, Power Planning Division	Northwest Power Planning Council

Dr.	Wayne	Lei	Director of Environmental Affairs	Portland General Electric
Dr.	Dennis	Lettenmaier	Professor of Civil Engineering, JISAO/SMA Climate Impacts Group	University of Washington
Mr.	Stephen	Lipscomb	Assistant District Chief for Hydrologic Data, Idaho Water District	U.S. Geological Survey
Dr.	Nathan	Mantua	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Mr.	David	Marshall	Executive Director	Fraser Basin Council
Mr.	Kyle	Martin	Mainstem Hydrologist	Columbia River Inter-Tribal Fish Commission
The Honorable	Larry	Mattson	Mayor Pro Tem	City of Yakima
Dr.	David	McAllister	Director, Habitat Division	Oregon Department of Fish and Wildlife
Mr.	Pat	McGrane	Program Manager for Rivers and Reservoirs	Bureau of Reclamation
Mr.	Ronald	McKown	ESA Program Manager	Bureau of Reclamation
Dr.	Edward	Miles	Professor of Marine Studies and Public Affairs, JISAO/SMA Climate Impacts Group	University of Washington
Mr.	Jim	Milton	Director	Tri-County Water Resources Agency
Mr.	Steve	Moddemeyer	Regional Relations and Sustainability, Office of Strategic Policy	Seattle Public Utilities
Dr.	Philip	Mote	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Mr.	Thomas	Myrum	Executive Director	Washington State Water Resources Association
The Honorable	Laird	Noh	Chair	Idaho Senate Resources & Environment Committee
Mr.	Barry	Norris	Administrator, Technical Service Division	Oregon Water Resources Department
Ms.	Kimberly	Nunes	Special Assistant to the Honorable Jay Inslee, Congressman (WA)	U.S. Congress
Mr.	Mike	O'Bryant	Reporter	Columbia Basin Bulletin
Dr.	Richard	Palmer	Professor of Civil Engineering, JISAO/SMA Climate Impacts Group	University of Washington
Mr.	Gary	Passmore	Director, Environmental Trust Department	Confederated Tribes of the Colville Reservation
Mr.	Scott	Pattee	Water Supply Specialist, Snow Survey and Water Supply Forecasting	U.S. Department of Agriculture, NRCS (WA)
Dr.	Don	Reading	Consultant, Ben Johnson Associates, JISAO/SMA Climate	University of Washington
Mr.	Jack	Robertson	former Acting Administrator for Bonneville Power Administration	(none)
Dr.	Edward	Sarachik	Professor of Atmospheric Sciences, JISAO	University of Washington
Mr.	George	Schneider	Water Resource Manager, Resource Management Branch	Seattle Public Utilities
Dr.	Richard	Slaughter	President, Richard Slaughter Associates, JISAO/SMA Climate	University of Washington
Ms.	Alexandra	Smith	Vice President for Environment, Fish, and Wildlife	Bonneville Power Administration
Mr.	Doug	Smith	Resource Planning Specialist	BC Hydro
Dr.	Amy	Snover	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Ms.	Nancy	Stephan	Manager, Weather and Streamflow Forecasting	Bonneville Power Administration
Mr.	Doug	Sutherland	Commissioner of Public Lands	Washington Department of Natural Resources
Dr.	Harvey	Thorleifson	Senior Program Manager	Natural Resources Canada
The Honorable	Cameron	Wheeler	Chair	Idaho House Resources & Conservation Committee
Ms.	Lara	Whitely Binder	Graduate Research Assistant, JISAO/SMA Climate Impacts Group	University of Washington

Climate and Water Policy Meeting - July 16-17, 2001, Skamania Lodge

Final Participants (listed by ORGANIZATION)

Prefix	First Name	Last Name	Title	Organization
Mr.	Jack	Robertson	former Acting Administrator for Bonneville Power Administration	(none)
Mr.	Doug	Smith	Resource Planning Specialist	BC Hydro
Mr.	Angus	Duncan	Executive Director	Bonneville Environmental Foundation
Ms.	Alexandra	Smith	Vice President for Environment, Fish, and Wildlife	Bonneville Power Administration
Ms.	Nancy	Stephan	Manager, Weather and Streamflow Forecasting	Bonneville Power Administration
Mr.	Pat	McGrane	Program Manager for Rivers and Reservoirs	Bureau of Reclamation
Mr.	Ronald	McKown	ESA Program Manager	Bureau of Reclamation
Mr.	Jack	Clark	Solid Waste/Environmental Engineer	City of Kennewick
The Honorable	Larry	Mattson	Mayor Pro Tem	City of Yakima
Mr.	Mike	O'Bryant	Reporter	Columbia Basin Bulletin
Mr.	Brian	Allee	Executive Director	Columbia Basin Fish and Wildlife Authority
Mr.	Kindy	Gosal	Community Liaison for the Environment Sector	Columbia Basin Trust
Ms.	Laura	Gephart	Watershed Projects Coordinator	Columbia River Inter-Tribal Fish Commission
Mr.	Kyle	Martin	Mainstem Hydrologist	Columbia River Inter-Tribal Fish Commission
Mr.	Gary	Passmore	Director, Environmental Trust Department	Confederated Tribes of the Colville Reservation
Mr.	Harold	Blackwolf, Sr.	Chairman, Fish and Wildlife Committee	Confederated Tribes of the Warm Springs Reservation
Governor	Daniel	Evans	former Governor and U.S. Senator for Washington	Daniel J. Evans Associates
Dr.	Stewart	Cohen	Adaptation and Impacts Research Group (AIRG), Sustainable	Environment Canada/University of British Columbia
Mr.	David	Marshall	Executive Director	Fraser Basin Council
Mr.	Johnny	Carline	Chief Administrator	Greater Vancouver Regional District
Mr.	Karl	Dreher	Director	Idaho Department of Water Resources
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Mr.	James	Buizer	Assistant Director, Office of Global Programs	National Oceanic and Atmospheric Administration
Mr.	Joshua	Foster	Senior Program Development Specialist, Office of Global Programs	National Oceanic and Atmospheric Administration
Mr.	David	Goodrich	Director, Climate Observations & Services Office	National Oceanic and Atmospheric Administration
Dr.	Harvey	Thorleifson	Senior Program Manager	Natural Resources Canada
Mr.	Justin	Gould		Nez Perce Tribe
Mr.	Blair	Henry	President	Northwest Council on Climate Change
Mr.	Gustavo	Bisbal	Senior Science and Policy Analyst, Fish and Wildlife Division	Northwest Power Planning Council
Mr.	Jeff	King	Senior Resource Analyst, Power Planning Division	Northwest Power Planning Council
Mr.	Greg	Armour	Secretary of the Board	Okanogan Basin Water Board
Mr.	Charles	Craig	Deputy Director	Oregon Department of Agriculture
Dr.	David	McAllister	Director, Habitat Division	Oregon Department of Fish and Wildlife
Mr.	Paul	Cleary	Director	Oregon Water Resources Department
Mr.	Barry	Norris	Administrator, Technical Service Division	Oregon Water Resources Department

Dr.	Wayne	Lei	Director of Environmental Affairs	Portland General Electric
Ms.	Nancy	Glaser	Director of Strategic Planning	Seattle City Light
Mr.	Steve	Moddemeyer	Regional Relations and Sustainability, Office of Strategic Policy	Seattle Public Utilities
Mr.	George	Schneider	Water Resource Manager, Resource Management Branch	Seattle Public Utilities
Dr.	Chad	Day	Professor, School of Resource and Environmental Management	Simon Fraser University
Mr.	Jim	Milton	Director	Tri-County Water Resources Agency
Mr.	Jim	Barton	Chief, Hydrologic Engineering Branch, North Pacific Region	U.S. Army Corps of Engineers
Ms.	Kimberly	Nunes	Special Assistant to the Honorable Jay Inslee, Congressman (WA)	U.S. Congress
Mr.	Stan	Fox	Assistant State Conservationist	U.S. Department of Agriculture, NRCS (OR)
Mr.	Scott	Pattee	Water Supply Specialist, Snow Survey and Water Supply Forecasting	U.S. Department of Agriculture, NRCS (WA)
Ms.	Cynthia	Barton	District Chief (WA)	U.S. Geological Survey
Mr.	Stephen	Lipscomb	Assistant District Chief for Hydrologic Data, Idaho Water District	U.S. Geological Survey
Mr.	Jeff	Allen	State Director of the Environment for Senator Mike Crapo (ID)	U.S. Senate
Dr.	Doug	Kenney	Professor, Natural Resources Law Center	University of Colorado, Law School
Mr.	Alan	Hamlet	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Ms.	Adrienne	Karpov	Program Manager, JISAO/SMA Climate Impacts Group	University of Washington
Dr.	Dennis	Lettenmaier	Professor of Civil Engineering, JISAO/SMA Climate Impacts Group	University of Washington
Dr.	Nathan	Mantua	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Dr.	Edward	Miles	Professor of Marine Studies and Public Affairs, JISAO/SMA	University of Washington
Dr.	Philip	Mote	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Dr.	Richard	Palmer	Professor of Civil Engineering, JISAO/SMA Climate Impacts Group	University of Washington
Dr.	Don	Reading	Consultant, Ben Johnson Associates, JISAO/SMA Climate Impacts Group	University of Washington
Dr.	Edward	Sarachik	Professor of Atmospheric Sciences, JISAO	University of Washington
Dr.	Richard	Slaughter	President, Richard Slaughter Associates, JISAO/SMA Climate	University of Washington
Dr.	Amy	Snover	Research Scientist, JISAO/SMA Climate Impacts Group	University of Washington
Ms.	Lara	Whitely Binder	Graduate Research Assistant, JISAO/SMA Climate Impacts Group	University of Washington
The Honorable	Karen	Fraser	Chair	WA Senate Environment, Energy, & Water Comm.
Ms.	Linda	Crerar	Policy Assistant to the Director	Washington Department of Agriculture
Mr.	Lee	Faulconer	Policy Assistant to the Director	Washington Department of Agriculture
Mr.	Tom	Fitzsimmons	Director	Washington Department of Ecology
Mr.	Steve	Keller	Regional Director and Agency Drought Coordinator	Washington Department of Fish and Wildlife
Mr.	Doug	Sutherland	Commissioner of Public Lands	Washington Department of Natural Resources
Mr.	Steve	Johnson	Executive Director	Washington Public Utility District Association
Mr.	Thomas	Myrum	Executive Director	Washington State Water Resources Association

BREAKOUT GROUPS - JULY 16-17, 2001

Group 1**: D. Lettenmeier, N. Mantua, R. Slaughter

First Name	Last Name	Title	Organization
Gustavo	Bisbal	Senior Science and Policy Analyst, Fish and Wildlife Division	Northwest Power Planning Council
James	Buizer	Assistant Director, Office of Global Programs	National Oceanic and Atmospheric Administration
Jack	Clark	Public Works Director	City of Kennewick
Linda	Crerar	Policy Assistant to the Director	Washington Department of Agriculture
David	McAllister	Director, Habitat Division	Oregon Department of Fish and Wildlife
Karl	Dreher	Director	Idaho Department of Water Resources
Angus	Duncan	Executive Director	Bonneville Environmental Foundation
Karen	Fraser	Chair	WA Senate Environment, Energy, & Water Comm.
Kindy	Gosal	Community Liaison for the Environment Sector	Columbia Basin Trust
Doug	Kenney	Professor, Natural Resources Law Center	University of Colorado, Law School
Ronald	McKown	ESA Program Manager	Bureau of Reclamation
Ken	Messerle	Chair	Oregon Senate Natural Resources, Agriculture, Salmon, and Water Committee
Jim	Milton	Director	Tri-County Water Resources Agency
Laird	Noh	Chair	Idaho Senate Resources & Environment Committee
Gary	Passmore	Director, Environmental Trust Department	Confederated Tribes of the Colville Reservation
Jack	Robertson	former Acting Administrator for Bonneville Power Administration	(none)
George	Schneider	Water Resource Manager, Resource Management Branch	Seattle Public Utilities
Doug	Smith	Resource Planning Specialist	BC Hydro
Harvey	Thorleifson	Senior Program Manager	Natural Resources Canada

Breakout Group 2**: R. Palmer, P. Mote, L. Whitely Binder, D. Reading

First Name	Last Name	Title	Organization
Brian	Allee	Executive Director	Columbia Basin Fish and Wildlife Authority
Jeff	Allen	State Director of the Environment for Senator Mike Crapo (ID)	U.S. Congress
Jim	Barton	Chief, Hydrologic Engineering Branch, North Pacific Region	U.S. Army Corps of Engineers
Harold	Blackwolf, Sr.	Chairman, Fish and Wildlife Committee	Confederated Tribes of the Warm Springs Reservation
Brian	Brown	Assistant Regional Administrator, Hydro Programs	National Marine Fisheries Service
Gary	Chandler	Co-chair	WA House Agriculture and Ecology Committee
Paul	Cleary	Director	Oregon Water Resources Department
Lee	Faulconer	Policy Assistant to the Director	Washington Department of Agriculture
Stan	Fox	Assistant State Conservationist	U.S. Department of Agriculture, NRCS (OR)
Mary	Gautreaux	Field Representative for Natural Resources, Senator Ron Wyden (OR)	U.S. Congress
David	Goodrich	Director, Climate Observations & Services Office	National Oceanic and Atmospheric Administration
Blair	Henry	President	Northwest Council on Climate Change
Steve	Johnson	Executive Director	Washington Public Utility District Association
Wayne	Lei	Director of Environmental Affairs	Portland General Electric
Stephen	Lipscomb	Assistant District Chief for Hydrologic Data, Idaho Water District	U.S. Geological Survey
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Larry	Mattson	Mayor Pro Tem	City of Yakima
Thomas	Myrum	Executive Director	Washington State Water Resources Association
Alexandra	Smith	Vice President for Environment, Fish, and Wildlife	Bonneville Power Administration
Doug	Sutherland	Commissioner of Public Lands	Washington Department of Natural Resources

**** NOTE: Actual participation in groups varied. Some listed participants may not have stayed for the breakout sessions.**

Group 3**: E. Miles, A. Hamlet, A. Snover, S. Cohen

First Name	Last Name	Title	Organization
Greg	Armour	Secretary of the Board	Okanogan Basin Water Board
Cynthia	Barton	District Chief	U.S. Geological Survey
Johnny	Carline	Chief Administrator	Greater Vancouver Regional District
Betsy	Close	Chair	Oregon House Water and Environment Committee
Charles	Craig	Deputy Director	Oregon Department of Agriculture
Chad	Day	Professor, School of Resource and Environmental Management	Simon Fraser University
Daniel	Evans	former Governor and U.S. Senator for Washington	Daniel J. Evans Associates
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Josh	Foster	Senior Program Development Specialist, Office of Global Programs	National Oceanic and Atmospheric Administration
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Steve	Keller	Regional Director and Agency Drought Coordinator	Washington Department of Fish and Wildlife
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Kyle	Martin	Mainstem Hydrologist	Columbia River Inter-Tribal Fish Commission
Pat	McGrane	Program Manager for Rivers and Reservoirs	Bureau of Reclamation
Steve	Moddemeyer	Regional Relations and Sustainability, Office of Strategic Policy	Seattle Public Utilities
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