Council QUARTERLY
Northwest Power and Conservation Council
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Striking a Balance Between Energy and the Environment in the Columbia River Basin

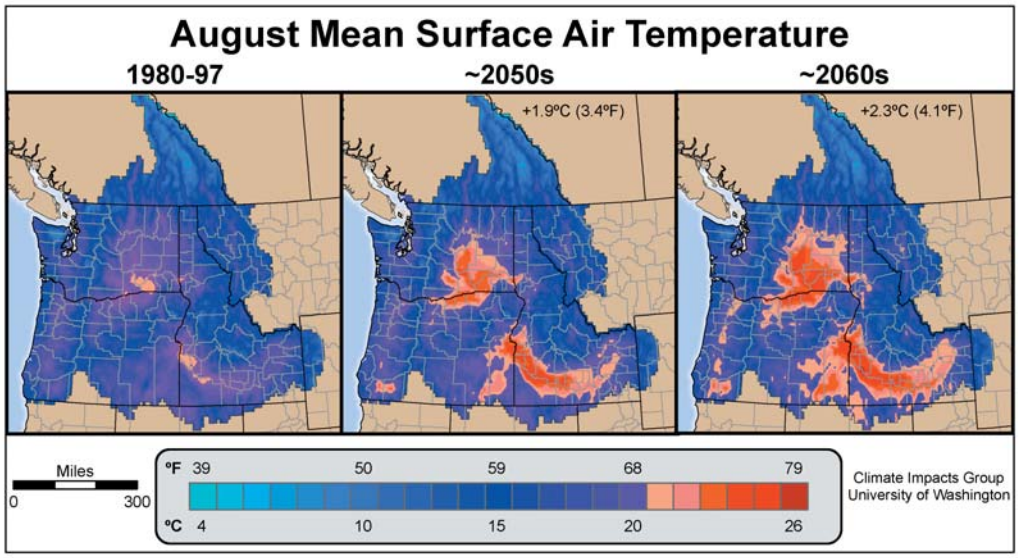
Climate Change in the Northwest

Our world is changing, and we're causing it. A report by the Intergovernmental Panel on Climate Change, released in early 2007, said it was "unequivocal" that global warming was occurring, and that it was at least 90 percent certain humans were responsible.

The IPCC has tracked research on human-caused global warming since its creation by the United Nations in 1988. In its follow-up report released this spring, the group describes the specific effects of climate change on people, species, and regions. Written by hundreds of scientists and reviewed by outside experts and government officials, the report warns that adaptation is essential because decades of rising temperatures and seas are already inevitable due to the buildup of carbon dioxide and other long-lived greenhouse gases in the atmosphere.

Here in the Pacific Northwest, where we depend on mountain snow pack to feed a river system that produces electricity from hydropower dams, irrigates crops, provides habitat for fish and wildlife, and recreation, the implications are sobering.

While the release of the IPCC reports signal a turning point in the world's focus on this problem, regional policymakers and scientists have also been looking at how climate change could affect the Northwest. In 2006, the Northwest Power and Conservation Council asked the Independent Scientific Advisory Board to examine the issue of climate change and its potential effects in the Columbia River Basin. The ISAB provides independent scientific advice on fish and wildlife issues to the Council, NOAA Fisheries, and Columbia River Indian tribes.



Areas of the region expected to be most affected by climate change.

This spring, the board released its *Climate Change Impacts on Columbia River Basin Fish and Wildlife*. In it, the board reviews the greenhouse effect, the role humans have played in altering this natural process, and how these changes may affect the Columbia River Basin. In particular, the report looks at the potential impacts to the basin's fish and wildlife.

The spring edition of the Council Quarterly is devoted to the major findings of the report, and to the issue of climate change on the Northwest.

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What's Inside

Climate Change Impacts Could Affect Columbia River Hydropower Generation

The Northwest Power Act of 1980, the federal law that authorized creation of the Northwest Power and Conservation Council, directs the Council to plan for an adequate, efficient, economical, and reliable electricity supply in the region. The Act recognizes that hydropower is the primary source of the region's electricity and directs the Council to treat the entire Columbia River and its tributaries as a single system when planning for the region's future electricity supply.

Because hydropower supplies about half of the region's electricity, most of it generated at dams on the Columbia River and its tributaries, the Council closely follows annual precipitation and runoff in the Columbia River Basin, and also predictions of the annual river runoff. For this reason, global climate change and the potential impacts of climate change on the water supply in the basin are of interest to the Council.

In the Fifth Northwest Power Plan, completed in December 2004, the Council addresses the potential impacts of climate change to the Columbia River hydropower supply and recommends policies and actions that could be adopted and implemented today to prepare for potential future impacts.

Global climate change models all seem to agree that temperatures will be higher in the future, but the models disagree somewhat on future levels of precipitation. Some models suggest that the Northwest will be drier, and others indicate more precipitation in the long term. But all the models predict less snow and more rain during winter months, resulting in a smaller spring snow pack. Winter electricity demands would decrease with warmer temperatures, easing the Northwest's peak electricity requirements. In the summer, however, demand for power would rise, driven by air conditioning and irrigation loads, and could potentially force the region to compete with southern California for electricity resources.

All of these changes have implications for the Columbia River and its tributaries. More winter rain would likely result in higher winter river flows. Less snow would mean a heavier runoff volume in winter and a lower runoff volume in the spring and summer, resulting in lower flows during summer months. This could lead to many potential impacts, such as:

- Increasing the importance of flood control storage to reduce the risk of winter flooding
- Boosting hydropower production in winter, when Northwest demand for power is likely to decrease because of warmer winter temperatures
- Reducing the size of the spring runoff and shifting its timing to slightly earlier in the year
- Reducing late spring and summer river flows and potentially causing average water temperatures to rise
- Jeopardizing the survival of salmon and steelhead that migrate in the late spring and into the summer months because of lower river flows and higher water temperatures
- Reducing the ability of reservoirs to meet demands for irrigation water
- Reducing summer power generation at hydroelectric dams when Northwest demand and power market prices are

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Notes From the Chair

In its recent report on the effects of climate change on fish and wildlife in the Columbia River Basin, the Independent Scientific Advisory Board presents a thorough and compelling picture of the latest science and predictions regarding climate change. It is a potential future, to put it bluntly, where all the rules have changed. This edition of the Council Quarterly looks at the report's key points and its recommendations for mitigating the impacts of climate change.

For 25 years, the Northwest Power and Conservation Council has been a forum for decisionmaking on two of our most important regional assets: fish and wildlife and hydropower. With the goal of protecting both resources, the Council has developed innovative approaches—from energy forecasting to scientific review of fish and wildlife funding—to fulfill that mission. Perhaps most importantly, it has worked with input from a broad and diverse community of stakeholders. The challenges presented by the potential effects of climate change on the Pacific Northwest, while daunting, are not insurmountable. As in the past, the region's commitment to cooperation and open debate will offer the best means to finding ways to mitigate climate change impacts.

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likely to increase because of higher air conditioning needs in the Northwest and Southwest

• Affecting summer and fall recreation activities because of lower reservoir elevations in the reservoirs behind dams

There also are potential impacts away from the river system, particularly for the electricity industry. Current scientific knowledge holds that atmospheric warming, the predicted effect of climate change, largely results from increased production of carbon dioxide and other greenhouse gasses due to human activities. Because of the widespread use of fossil fuels to produce electricity, the electricity industry worldwide is a principal contributor to the growing atmospheric concentration of carbon dioxide and would be affected by any initiatives to reduce carbon emissions.

Growing concern in the industry about the impact of carbon-emission control policies, such as the imposition of a carbon tax, have prompted aggressive development of wind power in the Pacific Northwest. All four Northwest states have identified renewable energy, particularly wind power, and also energy conservation, as key resources for the electric utilities in the future.

To assess the potential future impacts of global climate change in the Pacific Northwest, the Council worked with the Climate Impacts Group of the Joint Institute for the Study of the Atmosphere and Ocean at the University of Washington. The Climate Impacts Group has compiled a set of projected future temperature and precipitation changes in the Northwest based on four global climate models. Each of the models shows a net temperature and precipitation increase in the future, but there is great variation in their forecasts.

Despite these inconsistencies, the models agree that, overall, there will be greater winter runoff volume and lower summer runoff volume in the Columbia River Basin in the future. The Council used the output of two of the climate models, representing the extremes of future conditions, and a composite of the output of those models, in assessing future impacts on the hydropower system using two power system simulation models. One simulates the physical operation of the hydroelectric and thermal power plants in the Northwest, and the other forecasts electricity prices based on demand for power and the power supply in the West. It was no surprise that the modeling suggested that under a warm and dry future scenario, the hydroelectric system would generate less power and that under a warm-and-wet scenario, the system would generate more power than at present. From the modeling, the Council concluded that 1) the expected annual change in hydroelectric generation due to climate change depends heavily on forecasted changes to future precipitation, which is very uncertain; and 2) power system benefits or costs of climate change correspond directly with the change in runoff volume.

Despite these inconsistencies, the models agree that, overall, there will be greater winter runoff volume and lower summer runoff volume in the Columbia River Basin in the future.

The question for the Council, and also for other energy planners in the region, is what can be done now to prepare for the predicted climate-change impacts, should they occur? The Council's power plan suggests that strategies should be developed to 1) help suppress the warming trend; and 2) mitigate any potential impacts. In terms of suppressing warming trends, the net carbon dioxide production of the regional power system should be reduced. Any incentive to reduce greenhouse gases should be examined, and electricity customers should be encouraged to use their energy more efficiently, according to the power plan. Other actions recommended in the power plan include:

• Developing low-carbon energy sources such as clean-coal technologies
• Substituting more efficient lower-carbon producing energy technologies for older, less efficient generating technologies, and
• Offsetting unavoidable carbon dioxide production with carbon-sequestration technologies

While the power plan does not recommend immediate changes in Columbia or Snake river reservoir operations, potential actions to offset climate change impacts on the hydropower system should be identified, according to the power plan. Some of these actions may include:

• Adjusting reservoir operations to assure that reservoirs are full by the end of June
• Allowing reservoirs to draft lower in summer months, for power production, than required under the Endangered Species Act to protect listed salmon and steelhead stocks
• Negotiating with British Columbia to release more water from Canadian reservoirs in summer
• Using increased winter streamflows to refill reservoirs in both the United States and British Columbia
• Exploring the development of generation and conservation resources to replace winter hydropower generation and satisfy higher summer demand for electricity

The Council's power plan, and the January 2007 Biennial Monitoring Report on the plan, which provides a summary of major developments in the regional electricity system since the plan was adopted, are available on the Council's website, www.nwcouncil.org.

CQ

Northwest Q & A: Philip Mote

Dr. Philip Mote is a research scientist at the University of Washington, in the Climate Impacts Group (CIG), and an affiliate professor in the Department of Atmospheric Sciences. His research interests include Northwest climate and its effect on snow pack, streamflow, and forest fires. A frequent public speaker, he has also written about 70 scientific articles and edited a book on climate modeling, published in 2000. In 2003 he became the Washington State climatologist. He served as a lead author of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change released in 2007.

The recent IPCC reports, and now the Independent Scientific Advisory Board's report on climate change, describe very serious implications for the environment and people around the world and in the Pacific Northwest. How alarmed should we be about the trends we are seeing?

I wouldn't use the word "alarmed", but people in positions of responsibility for future resources should take very seriously the statements by the scientific community that a global-scale warming that began in the 20th century will continue through the 21st century and is already affecting snowmelt-driven hydrology in the West. Reductions in natural summer streamflow, shifts toward earlier snowmelt, and reductions in late-summer soil moisture have already been observed or inferred and will accelerate, with significant (but not entirely negative) consequences for irrigated agriculture, forest wildfire, hydropower production, and more.

What should we be doing now to mitigate the effects of climate change? Are there immediate actions we should be taking now?

This is a question about greenhouse gas policy and I will stick to the science in these remarks.

> "All of the alternate explanations for recent warming (solar variability, natural internal variability of the climate system, cosmic rays) fail spectacularly to explain the recent pattern and pace of warming.
>
> Philip Mote,
> University of Washington

What do you say to skeptics who doubt that these changes are man-made?

The greenhouse effect is hugely important to the surface energy balance of our planet, and humans have unquestionably altered the strength of the greenhouse effect by increasing the quantities of all major greenhouse gases. Patterns and pace of temperature change in the last 50 years strongly resemble theoretical expectations of temperature change based on rising greenhouse gases. All of the alternate explanations for recent warming (solar variability, natural internal variability of the climate system, cosmic rays) fail spectacularly to explain the recent pattern and pace of warming.

You've been tracking climate in the Northwest for some time now. How confident are you in the research and models being used? What are the uncertainties?

Global climate models have done a remarkable job at simulating the rate of warming in the past 50 years both globally and in the Northwest. They don't do as well at precipitation. The safest

projection given what we know today is a warming of 0.5F per decade, easily exceeding "natural" warming rates pre-1960, and slight increases in winter precipitation, but not detectable statistically above the background 20th century variability.

We've been reading and hearing a great deal about the broad, general impacts of climate change–severe water shortages in the Southwest and reduced snowpack in the Northwest. Are there less obvious changes we should be aware of? Are there surprises in store for us?

Yes, but if we knew what they were, they wouldn't be surprises.

Is there a timeline of change? When will we really start to feel the consequences of these changes in our environment?

Some consequences are already being felt.

The tendency is to look at our own part of the world with respect to climate change. But aren't there deeper concerns, too, about how the effects of a warming climate worldwide could impact the Northwest? I'm thinking of economic and social consequences.

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Yes, that's quite true. Agricultural productivity elsewhere is a big factor for local economics. If climate events spur environmental refugees and political instability, that could affect us here too.

Have you learned anything in your research that has surprised you?

When I started looking at snow data in 2003 I didn't expect to find any evidence of warming, but in fact much of the Northwest's mountain snow pack is very sensitive to warming. This is most easily seen by comparing low elevations (where trends have been more than 50% downward over the last 40-60 years) with high elevations (where trends have been flat). These results really surprised me. CQ

Canadian Agency Involves Columbia Basin Residents in Discussions of Potential Climate Change Impacts

In 2006, the Columbia Basin Trust, the Council's closest counterpart agency in British Columbia, commissioned the Pacific Climate Change Impact Consortium of the University of Victoria, and a number of other scientific researchers, to develop preliminary information on future climate change in the Canadian portion of the Columbia River Basin. The Trust is using the information to initiate a public dialogue on climate change and impacts in the communities of the Canadian Columbia River Basin.

The resulting report synthesizes current technical knowledge, and provides future projections regarding ground transportation, water supply, community infrastructure and safety, and hydropower.. The Trust acknowledged that there are significant gaps in information and that extensive research and monitoring will be needed to fully understand this complex and important issue.

Like the Council's Fifth Northwest Power Plan, the CBT report predicts warmer temperatures, less snowpack, and changing streamflow patterns in the future. Regarding hydropower, the report predicts that summer electricity demand will increase over time as customers in the Pacific Northwest install more air conditioning equipment. Winter demand for electricity is expected to decrease somewhat. Shifts in the seasonal timing of hydropower production may be required to meet these changing demands with more use of water storage in summer, according to the report – the same time of year that entities in the United States might be trying to acquire water from British Columbia for downstream power production and flow-augmentation purposes.

In isolation, winter hydropower production in the Columbia River system is relatively resilient to streamflow timing shifts, according to the report, but winter hydropower production will be affected by the need to mitigate impacts to other system objectives such as flood control and instream flow augmentation. Adaptation decisions will need to respect the water needs of other users and in-stream uses to protect recreational interests, private property, ecosystems, and fisheries, especially with increased competition over an increasingly limited summer water supply, the report recommends.

With the snow pack in Canada being much less sensitive to warming than in the U.S. portion of the Columbia River system, over the next 50 years, summer snowmelt in Canada is likely to contribute more to summer streamflows, the report states. These differing impacts have the potential to unbalance current international agreements, and likely will present serious challenges to meeting instream flows in the United States, especially in the summer. Current Canada-U.S. agreements will need to adopt a more flexible approach to meet new and increasing demands for water as well as changing streamflow scenarios, the report predicts. This emphasizes the necessity of joint long-term planning and cooperation.

CQ

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A Warming Climate

Since 1900, the Northwest has been getting warmer. Regularly collected measurements indicate that the region's springtime snow pack has declined substantially from 1950 to 1997 due to reduced precipitation and rising winter temperatures. In addition, from 1948 to 2000, the timing of springtime snow melt runoff came earlier in most rivers by one to two weeks depending on the basin. One of the main reasons for this trend is warmer temperatures in the winter and spring. As the report notes, "Taken together, a wealth of evidence paints a very consistent picture of a warming climate over the past 150 years for both the Pacific Northwest and the Earth as a whole."

Why is this happening? For the planet as a whole, it centers on a fundamental climatic process called the greenhouse effect. The greenhouse effect is a natural part of the Earth's climate system that makes our planet a hospitable place to live. Clouds and bright surfaces, like snow cover, reflect about 30 percent of the energy from the sun. A small fraction is absorbed by the atmosphere and the rest is absorbed by the Earth's surface. The absorbed solar radiation warms the Earth's surface and its heat is radiated up to the atmosphere as infrared radiation. Certain trace gases absorb infrared radiation, further warming both the atmosphere and the Earth's surface substantially. These radiation-absorbing gases are referred to as "greenhouse gases." Without the greenhouse effect, temperatures would be an icy 60°F cooler than they are today.

For any particular region, climate changes are also caused by changes in patterns of natural climate variability. El Niño and the Pacific Decadal Oscillation are known to play influential roles in Pacific Northwest climate from year-to-year, and even over periods spanning half a century. For example, a cool phase of the PDO pattern favored a relatively cool-wet climate for the region from the mid-1940s through the mid-1970s, while a warm phase of the PDO favored a relatively warm-dry climate for the region from the mid-1920s through the mid-1940s, and again from the late-1970s through the late-1990s. The trend to a warmer Pacific Northwest climate since 1950 is a consequence, then, of both natural and human-caused changes in the climate system.

Although the intensity of the greenhouse effect has varied over geologic time, with very warm eras coinciding with periods of abundant atmospheric greenhouse gases, and cool eras coinciding with periods of relatively low levels of greenhouse gases, the buildup of man-made greenhouse gases has increased dramatically in the 20th century, especially since 1950. Burning fossil fuels, from cars and power plants for example, and converting forests into agricultural lands, account for the observed rise of carbon dioxide in the atmosphere, a key greenhouse gas.

The telling connection is that this buildup coincides with the Earth's rising temperatures. Eleven of the last 12 years

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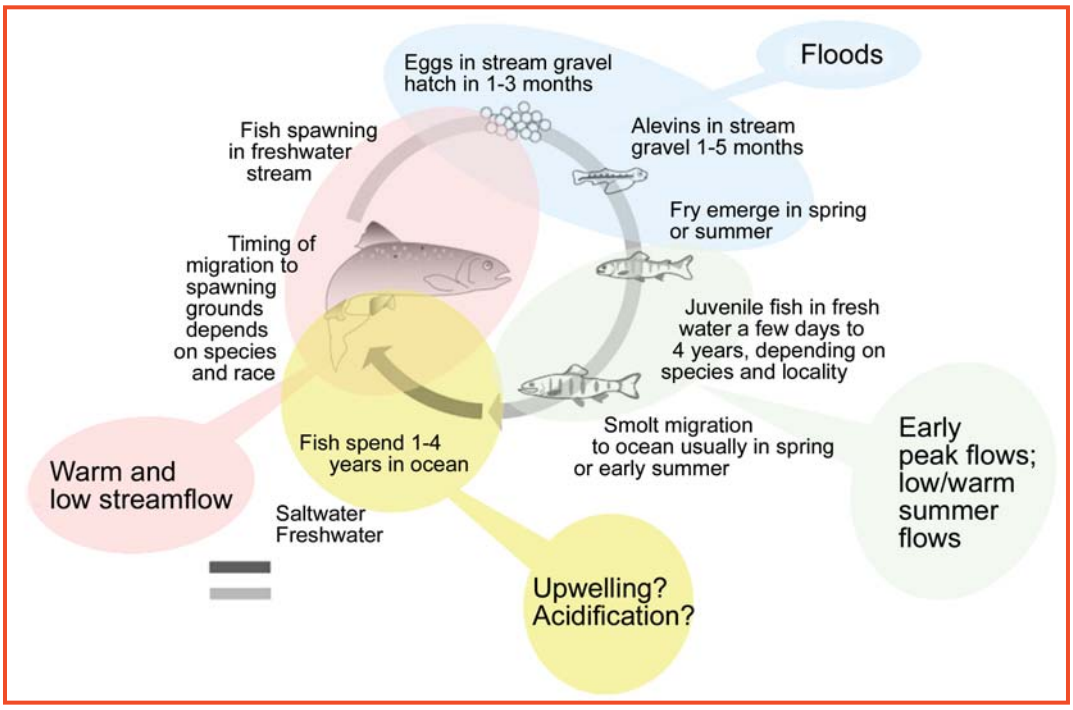
Cumulative Impacts Across the Full Life Cycle of Salmon



(1995-2006) rank among the 12 warmest years in the record of global surface temperature (since 1850). Climate records show that the Northwest has warmed about 1 degree Celsius since 1900, or about 50 percent more than the global average warming over the same period. Over the next century, the warming rate for the Pacific Northwest is projected to be in the range of 0.15 to 0.6 degrees Celsius per decade.

"Future warming at these rates would lead to substantial changes in the region's climate and hydrology," says Dr. Nate Mantua, ISAB member. "It would be obvious to everyone."

Adding to the impact of these gases on the atmosphere is how long they can last: A molecule of carbon dioxide can remain in the atmosphere from five to 200 years; synthetic greenhouse gases produced for industry can last many centuries to millennia. In other words, substantial damage has already been done. The changes currently unfolding cannot be reversed, but their ill-effects may be lessened, if we act now. At the very least, considering the potential risks of climate change in the region's energy and fish and wildlife planning would be a prudent and responsible course of action.

While the evidence of a warming planet is compelling, uncertainties remain. First, no one knows the exact quantities of carbon dioxide and other significant greenhouse gases that will be emitted in the next century. Projecting future emissions requires educated guesses about global economics, technology, and population. Second, we don't know how sensitive the climate system is to a given change in greenhouse gas concentrations. There are major challenges in simulating the behavior of clouds, the effects of aerosols, the carbon cycle, and how the ocean moves heat from its surface to deeper waters. Still, scientists have been assessing the possible effects of an intensified greenhouse effect on the Earth's climate, and at both the very simple and very sophisticated extremes, every climate model in use today finds that increasing concentrations of greenhouse gases in the 21st century will intensify the greenhouse effect and warm the Earth's surface and lower atmosphere.

> "It's possible that certain life history types, or even species, may be extirpated from the system if changes are severe enough."
>
> Dr. Robert Bilby
> ISAB member and co-author of the report

Key Effects on the Northwest

A warming climate will bring profound changes to the character of the region. Imagine Ponderosa pine trees growing west of the Cascades, and rainforest conifers like western hemlock decreasing west of the Cascades, but expanding into the mountain ranges of the interior West. These are just a few of the changes we can expect with warming temperatures. According to the panel's report, "Predicted climate shifts over the next century...lead to the expectation that there will be dramatic changes in the character of Pacific Northwest forestland." The report goes on to state, "alpine habitats, subalpine spruce-fir forests, and aspen are expected to be largely eliminated from the western United States and displaced northward to Canada."

Responding to the anticipated shifts in vegetation and climate, wildlife species may disappear from their former ranges and reappear in new areas. As species shift, changes in wildlife assemblages may expose species to new predators and competitors, allowing some species to expand their ranges and others to contract. Changes in climate may mean the earlier arrival of migrant birds, hibernating animals will emerge earlier, and some plants will bloom earlier. These changes may cause migration timing to no longer correspond with the timing of growing plants or animals that provide food for migrants.

And as the West becomes drier, the threat of wild fires looms large. Virtually all future climate scenarios predict increases in wild fires in western North America, including the Columbia Basin. Fire frequency and intensity have increased in the past 50 years, and especially the past 15 years, in the shrub steppe and forested regions of the West. Drought and hot, dry weather have also led to an increase in outbreaks of insects, which are likely to become more common and widespread. Outbreaks of forest insects affect roughly 45 times as much area as fire, and forest insects and pathogens are especially likely to change with climate.

Impacts to Fish

Changes in the region's temperatures and precipitation will alter the basin's snow pack, streamflow, and water quality. Warmer temperatures will result in more precipitation falling as rain rather than snow; snow pack will diminish, and streamflow will be altered; peak river flows will likely increase; and water temperatures will continue to rise. For Pacific salmon, these changes will affect all species and life history types, as will changes in the estuary and the ocean. In a blunt assessment of the risk climate change poses to salmon restoration, the report notes, "Climate change has the potential to fundamentally alter the

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capacity of the Columbia River system to produce salmon."

A number of studies on how climate change could affect cold water fishes have been done; one analysis that considered a high-end warming scenario suggests that temperature increases alone will render 2 to 7 percent of current trout habitat in the region unsuitable by 2030; 5 to 20 percent by 2060; and 8 to 33 percent by 2090.

The impact to salmon habitat can be especially damaging, in part because these fish can only occupy areas below barriers and so are restricted to lower, warmer elevations. Salmon habitat loss would be most severe in Oregon and Idaho, with potential losses under high-end scenarios exceeding 40 percent by 2090. Loss of salmon habitat in Washington would be less severe. The worst case projection is about a 22 percent loss by 2090. As significant as these estimates are, however, they do not include the effects of a changing hydrology.

Hydrologic changes to Columbia Basin streams will be driven primarily by the reduction of snow pack as temperatures warm and the snowline moves upward. In the region's mid-elevation river basins that now carry a substantial snow pack, the result of these changes will be a higher frequency and intensity of flooding, earlier snowmelt runoff, and reduced summer and early autumn flows. In the coldest, highest elevation basins of the Northwest, a warmer climate would reduce the risk of large summertime snowmelt floods because of the trend to more winter precipitation falling as rain rather than snow.

The expectation that the region's typical spring-summer runoff will shift to a more winter-spring rain and runoff is one of the most confident projections for how climate change will affect the Pacific Northwest's hydrology. Areas at elevations beween 3,000 and 4,000 feet in the basin will likely experience the biggest declines in snow pack. For affected watersheds, the reduced snow pack will mean lower flows in streams from June through September. The region's normally low late-summer and early-fall stream flows are likely to be reduced even more, while streamflows are likely to rise from December through April.

"The effect of climate change on freshwater ecosystems will impact most dramatically those fish species that have extended periods of freshwater rearing, but even species with abbreviated freshwater rearing, like chum salmon, may be impacted by higher water temperatures during egg incubation and changes in winter and early spring flows," says Dr. Robert Bilby, ISAB member and co-author of the report. "It's possible that certain life history types, or even species, may be extirpated from the system if changes are severe enough."

The ocean, too, will be affected. Scientific evidence strongly suggests that global climate change is already altering marine ecosystems from the tropics to the polar seas. Warming ocean temperatures could affect the ocean's ability to produce and circulate nutrients for salmon growth and survival, changing salmon behavior, distribution, and migrations. If salmon migrate farther north to find food, it could delay their maturation and adult migration into coastal waters and rivers.

Mitigating the Effects of Climate Change

As the report notes in its introduction, restoration plans and recovery strategies generally do not consider the impacts of climate change. But, the report goes on to say, "...the changes in regional snow pack, streamflows, and temperature in the Columbia Basin...projected by most climate models could have a profound impact on the success of restoration efforts and the status of Columbia River fish and wildlife populations."

"Given the high probability that climate change in the Columbia Basin will have major impacts on fish and wildlife habitat over the coming decades," says Bilby, "including climate change risks in fish and wildlife planning will be critical if these plans are to succeed."

Although the only true solution to reducing greenhouse gas emissions lies in global cooperation, the report identifies actions that may help to offset some of the negative effects of climate change in the Columbia River Basin. They are, however, "...only near-term, local options for dealing with climate-change effects."

According to the report, mitigating for changes in hydrology and temperature in tributaries will involve many of the same approaches already being used to restore degraded freshwater habitat for salmon. "Any action that can help minimize water temperature increases or augment streamflow during the summer and autumn would contribute to this end." Also, protection of cold-water areas for migrating salmon and restoration of riparian habitats in headwater reaches should have high priority. For some of the projected changes, there are no options. There is little that can be done locally, for example, to offset the projected changes in the elevation, accumulation, and melt timing of snow pack, other than increasing the capacity for storing water behind dams or in acquifers.

Other actions to address climate change impacts include:

- Flow augmentation from cool-cold water storage reservoirs
- Increasing the capacity for storing water behind dams or in acquifers
- Use of removable surface weirs to reduce the time juvenile salmonids spend in the warm water of dam forebays
- Reduce water temperatures in the adult fish ladders with water drawn from lower, cooler parts in the water column of the dam forebays

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• Develop transportation strategies for initiating full transport of juvenile fall Chinook more focused on temperature changes

• Evaluate the possibility of transporting migrating adults through the lower Snake River when water temperatures reach near lethal limits in the late summer

• Expand the predator control program to species such as smallmouth and largemouth bass, walleye, and channel catfish

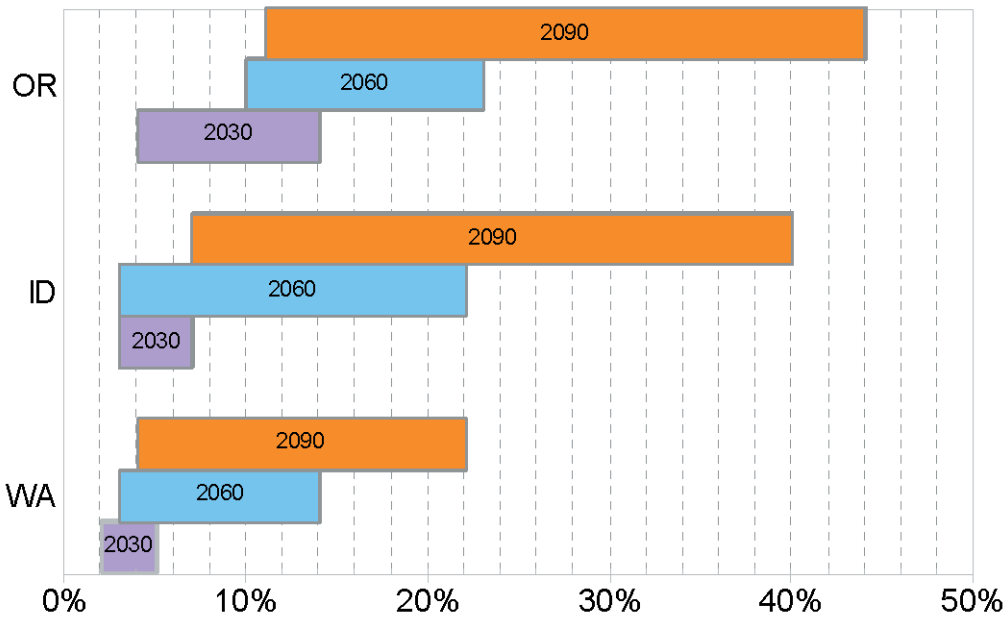
• Open backwater, slough, and other off-channel habitats along mainstem reservoirs and the estuary to encourage increased flow through these areas to help reduce water temperature and provide cool-water refuge

These techniques will only be effective if implemented at appropriate locations, emphasizing the importance of incorporating climate change into planning efforts. According to the report, "If the predicted changes occur, the distribution of fish and wildlife populations in the basin will change, and many currently suitable habitats will not be so in the future, regardless of actions taken at the local level."

The Northwest could also be affected by a drought-ridden Southwest. The usual pattern of energy sharing that occurs between the two regions—the Northwest sending its excess power to the Southwest in the summer to meet their load, and vice versa in the winter for the Northwest—may not be viable. Hotter summers will mean higher energy demands for the Northwest and less excess power to share. In contrast, warmer winter temperatures will likely reduce energy demand in the Northwest. This combination of seasonal changes in energy demand will likely prompt actions to adjust the seasonal production of hydropower. Population growth, already a challenging issue for many parts of the Northwest, may become even more pressing as the effects of climate change become increasingly apparent.

The overwhelming realization is that the historic competition over water use—already contentious—is likely to intensify. A world with less water and more people will mean difficult choices and a greater likelihood that everyone will feel the hardship.

With the release of the IPCC reports and now the ISAB's report on climate change, the region can begin to grapple with the implications of a greatly different world. The Council's role as a planning agency to protect the region's energy and environmental resources means its work will be critical to evaluating and assessing those challenges and opportunities. And, as with all change, the true test will be one of adaptation. CQ



Proportion of future salmon habitat loss in Idaho, Oregon, and Washington as a result of warming associated with climate change.

Success Stories — Swan River Valley

Montana bull trout habitat protected through collaborative public/private effort

A collaborative effort of state, federal, and tribal governments, and two environmental conservation groups, has resulted in a 7,200-acre conservation easement and the acquisition of 640 acres in western Montana that will increase protection of native bull trout and other fish and wildlife in the Swan River Valley.

The Bonneville Power Administration (BPA) provided a total of $10.7 in funding for the acquisitions, which included the final 1,121 acres of a 7,204-acre conservation easement in the Goat Creek and Squeezer Creek drainages, held by the Montana Department of Fish, Wildlife & Parks for $1.1 million, and a 640-acre parcel in the Elk Creek drainage, acquired by the Confederated Salish and Kootenai Tribes and the Swan Ecosystem Center for $9.6 million. These are tributary drainages to the Swan River, which flows into Flathead Lake.

Both purchases were authorized by the Northwest Power and Conservation Council through its Columbia River Basin Fish and Wildlife Program. Under the Northwest Power Act of 1980, the program, which is created and guided by the Council, is designed to mitigate the impacts of hydropower dams on fish and wildlife of the Columbia River Basin. The program is funded by BPA and is implemented through a variety of partnerships across the basin. These projects are specifically tied to fisheries mitigation of the impacts from the construction and operation of Hungry Horse Dam and Reservoir. The acquisition of the easement and land was accomplished with the assistance of the Trust for Public Land, a non-profit land conservation organization.

Photo courtesy of the Trust for Public Land.

In a news release announcing the acquisitions, Montana Governor Brian Schweitzer praised the collaborative effort and commented: "These projects will benefit fish and wildlife in the Swan River Valley for years to come."

Rhonda Whiting, one of Montana's two representatives on the Power Council and chair of the Council's Fish and Wildlife Committee, said that she and Bruce Measure, the other Montana member of the Council, were pleased that the projects came to fruition, adding, "We will continue to follow Governor Schweitzer's lead to make sure the Northwest Power and Conservation Council's Fish and Wildlife Program remembers the upstream interests in Montana."

The conservation easement is on land owned by Plum Creek Timber Company, the largest private landowner in the Swan Valley. In an interview with the Daily Inter-Lake newspaper of Kalispell, Plum Creek president Rick Holly said protecting the property was an important consideration in the decision to sell the conservation easement. "We are pleased to collaborate with our partners to protect this important property," Holly told the newspaper. "Over time, Plum Creek has offered 30 percent of its lands in the Swan Valley for conservation because we understand the important forestry, environmental, and recreational attributes of this property." The easement provides for fisheries habitat protection, forest management activities, and recreational access to the public.

Half of the tract at the mouth of Elk Creek is now owned by the Confederated Salish and Kootenai Tribes and the other half is owned by the non-profit Swan Ecosystem Center. "Elk Creek is a very important resource for native fish, for wildlife, and for the community," Anne Dahl, executive director of the Center, told the newspaper. "This project makes a significant contribution to protecting some of the most critical fisheries habitat in the heart of the Swan Valley." CQ

Council Decisions

Yakima Side Channels

March

The Council approved $500,000 for 2007, and the same amounts in 2008 and 2009, for the Yakama Nation to purchase floodplain land in the Yakima River Basin of central Washington to be managed as habitat for fish and wildlife, particularly spawning fall Chinook salmon. Five key reaches are targeted for protection/restoration actions. These include Easton (near the headwaters of the Yakima River), Cle Elum (from the vicinity of the Cle Elum River confluence to the Teanaway River confluence), near Ellensburg, near Union Gap (above the Union Gap divide), and Gleed, in the lower Naches River.

Fish Passage Center Oversight Board

June

In April, the Council released for public comment a proposal to reconstitute the oversight board of directors of the Fish Passage Center. In June, having received favorable comments on the proposal, the Council named six persons to positions on the oversight board. The Fish Passage Center is a public agency that collects and analyzes data on migrating salmon and steelhead in the Columbia and Snake rivers. Bruce Measure, a Montana member of the Council, will chair the board.

The Council's action reformulates membership of the oversight board and ensures that members have a scientific or technical background in disciplines related to the functions of the Center. Members of the board appointed in June include:

- Susan Ireland, fish and wildlife program director of the Kootenai Tribe of Idaho, who will represent Indian tribes of the upper Columbia River Basin
- Steve Yundt of the Idaho Department of Fish and Game, who will represent Idaho's and Montana's fish and wildlife departments
- Tony Nigro of the Oregon Department of Fish and Wildlife, who will represent Washington's and Oregon's fish and wildlife departments
- John Ferguson of NOAA Fisheries' Northwest Fisheries Science Center in Seattle, who will represent the federal fisheries agency
- Dan Goodman, a professor of biology at Montana State University, whose position on the oversight board represents Northwest fisheries scientists generally (the Council named Dick Whitney, a fisheries scientist who has served on Council scientific panels, as an alternate for this position)
- Doug Taki, a biologist with the Shoshone-Bannock Tribes of Idaho, whose position on the oversight board will be ex-officio; the Council will consider making that position permanent

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