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STRIKING A BALANCE BETWEEN ENERGY AND THE ENVIRONMENT IN THE COLUMBIA RIVER BASIN

REFORMS PROPOSED FOR COLUMBIA RIVER BASIN SALMON AND STEELHEAD HATCHERIES

A panel of experts on fish production issued a report in March that provides a roadmap for how salmon and steelhead hatcheries can be managed in the future to meet conservation and harvest goals in the Columbia River Basin.

The 14-member Hatchery Scientific Review Group (HSRG), which includes fish-production experts from state and federal agencies and Indian tribes, began its work in 2006. The review of Columbia River Basin hatcheries is the most comprehensive ever undertaken in the basin. Using an ecosystem approach, the HSRG analyzed every state, federal, and tribal salmon and steelhead hatchery program in the basin, covering 178 hatchery programs and 351 salmon and steelhead populations. The resulting report includes principles, recommendations, tools, and procedures that provide a foundation for managing hatcheries more effectively.

The HSRG based its analysis of hatchery programs on the framework in its earlier review of hatchery programs in Puget Sound and coastal Washington. Like that effort, the report identifies three principles as prerequisites for successful hatchery programs: 1) well defined goals, 2) scientific defensibility, and 3) informed decision-making.

An underlying assumption of the hatchery review is that the role of hatcheries ought to change. In the past, hatcheries were built primarily to mass-produce fish for harvest in the ocean and in rivers to mitigate the impact of hydropower dams. But mass production of hatchery fish contributed to the decline of less-abundant stocks because they were disproportionately overharvested. Today, hatcheries are seen as tools to use to rebuild wild stocks while also providing fish for harvest in rivers and in the ocean. The challenge for the HSRG was to determine whether conservation and harvest goals could be met by fishery managers, and if so, how.

The HSRG concluded that while hatcheries play an important role in managing salmon and steelhead populations in the Columbia River Basin, the tradi-

(See *Hatcheries* on page 10)


Dr. Peter Paquet addresses the crowd at the Hatchery Reform gathering.

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GOOD CONDITIONS SUGGEST BIG SALMON AND STEELHEAD RETURNS

Ocean conditions bode well for most salmon and steelhead runs in the Columbia River Basin this year and probably in 2010 as well, federal researchers told the Northwest Power and Conservation Council in March. The northern Pacific is cold and nutrient-rich, and that is good news for fish. Based on recent trends, the favorable conditions may not persist more than several years into the future and, if the ocean turns warmer in one of its periodic temperature shifts, salmon and steelhead would likely suffer.

Cal Groen, director of the Idaho Department of Fish and Game, told the Council he is optimistic about salmon and steelhead returns to the Snake River Basin this year. He said the partnership of state, tribal, and federal agencies is making good progress on the restoration of anadromous fish runs.

The pre-season forecast for Snake River spring/summer Chinook salmon predicted a very large return of about 106,000 hatchery-origin and 23,000 natural-origin fish crossing Lower Granite Dam. Since that forecast was developed, in-season information collected as fish move up the Columbia River suggests that only one-third to one-half of the originally forecasted runs will materialize. Even so, the 2009 return should equal or be greater than returns of spring/summer Chinook salmon to Lower Granite Dam in the last four years.

"We are looking at our ninth consecutive Chinook salmon fishing season in Idaho," Groen said. "2009 will also mark our third consecutive year for increased wild/natural Chinook. We're going to have our second fishery on the Sawtooth Hatchery spring Chinook since it was constructed in 1985. We've had our first fishery on Snake River fall Chinook in over 30 years. This year there's a lot of excitement in Idaho." Groen said he is particularly pleased with the progress on rebuilding Snake River sockeye, an endangered species. Last year, 902 fish were counted crossing Lower Granite Dam on their way to the Salmon River headwaters region. That compares to single-digit returns as recently as the early 1990s. Returning sockeye are trapped at the lake and spawned in a hatchery.

Each year after the returning fish are collected, adult sockeye from the breeding program are released by the Department of Fish and Game into the lake to spawn. Last year more than 960 were released, Groen said.

"We're putting the red back in Redfish Lake," he said.

Salmon and steelhead returns were strong elsewhere in the Columbia River Basin, as well. Pete Hassemer, the Fish and Game Department's anadromous fish manager, said that, in general, there was an upturn in the fall Chinook runs that return to hatcheries or spawning areas above Bonneville Dam in 2008.

(See Good Conditions on page 8)

Notes From the Chair

I am continually reminded, if I am paying attention, that all things connect, eventually; sometimes in surprising ways.

The story on the strong returns of salmon and steelhead to the Columbia River Basin is encouraging news. At the same time, research indicates that the ocean's warming and cooling cycles are becoming more variable, suggesting that we may begin to see more fluctuations in returns over time.

The hatchery report released this spring represents another step toward modernizing fish supplementation programs throughout the basin. It is a move to bring a 19th century practice firmly into the 21st century, and will help to ensure that this tool provides harvest for commercial and recreational fishing without harming natural populations.

With respect to the region's power system, the Council expects to release its draft Sixth Power Plan this summer. The plan, which strives to ensure an adequate, efficient, economical, and reliable power supply, will address one of the biggest concerns facing us today: the regulatory push to reduce carbon emissions. The conclusion to the two-part story on integrating wind energy gives us some idea of the challenges to meeting this goal, and what the costs are expected to be.

Finally, in thinking about connections, the story on the vast kinds of changes that may some day be possible through smart grid technology imagines a future of seamless interconnection, and a new order of efficiency.

THE SMART GRID: ELECTRICITY DISTRIBUTION 2.0

As with every other aspect of modern life, technology has the potential to transform the way our power system works, too, improving its safety, efficiency, and reliability. From utility meters that measure a homeowner's electricity use every few minutes to devices that sense load along the transmission and distribution system, the so-called smart grid is the next generation in power distribution.

Calling it the "nexus between Thomas Edison and the Internet," Terry Oliver, chief technological innovation officer for the Bonneville Power Administration, briefed the Council at its March meeting on a pilot project to gain information on how smart grid technologies can be effectively deployed. Such technologies cover a range of products geared to increase the flow of communication, creating a "smart grid" that monitors activities in real time and exchanges data about energy supply and demand.

Smart grid technology is one of the advances explored in the Council's upcoming Sixth Power Plan, and could, says Ken Corum, senior economist for the Council, enhance the ability of customers to solve power system problems and lower their electricity bills at the same time.

In the past, utilities have been able to call upon large industrial customers to change their energy use when the power system was stressed. Known as demand response, these contractual agreements enabled utilities to tap into reserves during emergencies or to meet peak load. Smart grid technologies may be able to help average households play a similar role.

For example, the technology could help coordinate the use of water heaters to meet peak load, aid in providing flexibility to the power system, and store energy. Currently, there are about 3.4 million electric water heaters in the region with an estimated total connected load of about 15,300 megawatts. The total water heating load on the system ranges from about 400 megawatts to 5,300 megawatts, depending on the season, day, and hour.

Although water heaters typically begin reheating the tank almost immediately when hot water is used, the supply of hot water will actually last for some time. If the power system is stressed, the reheating could be delayed, reducing load. During the delay, smart grid devices could sense if a water heater is running out of hot water and begin reheating so the consumer isn't affected. The household has hot water when it is needed, and strain on the power system is eased.

Water heaters, with appropriate control devices, could also be used to accept extra energy from the power system by increasing the water temperature. When hot water is used and reheated to its normal lower temperature, the energy reduction is "returned" to the power system. System operators could control water heating both up and down to accommodate fluctuations in load and fluctuations in variable generation like wind, helping to stabilize the power system.

For example, in the early morning hours during spring runoff the river is generating a lot of energy, but demand is low at that time of day. Perhaps the wind is generating a lot of power, too, adding to the imbalance. In such circumstances, system operators have few good options. They can reduce hydroelectric generation by increasing spill, losing revenue and perhaps harming fish or they can require wind turbine operators to reduce their generation, affecting their bottom line as well. In cases like this, water heaters could be used as an energy storage system to help bring the system into balance. New appliance standards that required sensors and control devices to be built into water heaters at the factory instead of retrofitted would greatly help in making this possibility a reality.

"Increased control could mean using water heaters as virtual batteries," says Corum. "Water heaters could store electricity when there is little or no demand, and release it when it has more value." CQ

COMING UP: THE SIXTH POWER PLAN

The 1980 Northwest Power Act gave the Pacific Northwest a voice in how it should meet its electricity needs while also protecting fish and wildlife affected by dams. The Act directs the Council to develop a plan to ensure the region of an adequate, efficient, economical, and reliable power system.

This summer, the Council will release its draft Sixth Power Plan amidst a daunting array of fast-moving challenges ranging from the fallout from the global economic crisis to climate change regulation.

One of the overarching issues driving energy planning today is climate change. The region—like much of the world—is grappling with how to lower greenhouse gas emissions, and because of this, wind generation continues to grow at a brisk pace. Since the last power plan, adopted in 2004, over 2,000 megawatts of wind capacity has been developed, producing about 755 average megawatts of energy. And there's much more to come. But wind power brings unique challenges, too. Its variability requires services to integrate it into the power system.

NORTHWEST 6th POWER PLAN

In this issue of the CQ, we conclude our two-part series on wind energy with a look at how much wind the power system could accommodate and at what costs. In the months to come, we'll be highlighting other key questions in the Sixth Power Plan. CQ

WIND GENERATION - PART II : HOW MUCH AND HOW MUCH WILL IT COST?

One of the key resources in the Council's Sixth Power Plan is likely to be wind generation. The winter edition of the Council Quarterly explored some of the characteristics of wind that makes it popular, along with the challenges it poses for the region.

So, how much wind do we think can be brought on line, and at what costs?

"Right now, we think there is between 4,000 and 5,000 megawatts of wind that could be developed with the existing transmission system, factoring in the Bonneville Power Administration's proposed plans for expansion and upgrades to the system," says Jeff King, senior resource analyst for the Council. "And this could be done without significantly raising transmission costs." The generation would come from plants in eastern Washington, Oregon, southern Idaho for Idaho, and a modest amount in Montana for Montana.

The estimated cost of new wind generation in the Columbia Basin, including the cost of system integration, is between $90 and $110 a megawatt-hour. This is somewhat greater than the estimated cost of power from a new natural gas combined-cycle plant at $85 - $90 a megawatt-hour, including the forecast cost of CO2 allowances, and geothermal, $70 - $85 a megawatt-hour. Long-distance wind generation imported from central Montana, central Alberta, and Wyoming is much more expensive, around $135 - $140, which is somewhat higher than new biomass, $120 - $135 a megawatt-hour, and the cost of new coal-fired power, $106 - $113 a megawatt-hour (including the forecast cost of CO2 allowances). All of these new generating resources are much more costly than power from Bonneville's existing system, $26.90 a megawatt-hour, primarily because of the increase in construction costs since the federal power system was constructed. The lowest cost new resource by far, however, is conservation, which the draft plan estimates at $34 per megawatt-hour.

To integrate 4,000 - 5,000 megawatts of wind generation, which is a variable resource, will require a more effective use of system flexibility--the ability of the system to adjust generation up or down to keep load and generation in balance. We will need to reduce wind's need for system flexibility while also tapping into the latent flexibility of the existing system. This would require both technical and institutional changes. "It's not a huge technical problem," says King. "It's more of an institutional question."

Improving wind forecasting, changing scheduling practices, and controlling rapid wind ramp-up rates will help reduce the demand for flexibility. Access to untapped system flexibility can be expanded by sharing scheduling errors among balancing areas, expanding dynamic scheduling capability and modifying existing thermal plants to provide flexibility where feasible. Dynamic scheduling allows system operators to have access to energy reserves in other balancing areas, including Canada and California. Such changes should enable the region to integrate the additional wind energy expected to be developed in the short term.

At some point, however, the existing flexibility of the system will be exhausted and additional system flexibility will have to be developed. In fact, because of transmission limitations, some utilities are already struggling to meet flexibility requirements. The Sixth Power Plan is expected to call on the region to assess at what point we will need to start building capacity in conjunction with wind, along with the most cost-effective options to supply capacity and flexibility: natural gas plants, storage systems, and demand response programs, for example.

"In most cases," says Maury Galbraith, Council resource analyst, "the region's utilities should be able to avoid adding physical generation solely for the purpose of augmenting the system's flexibility capability." CQ

Windy Ridge Washington photograph by C. Bruce Forster

NORTHWEST Q&A: STEVE KLEIN

PART TWO OF A TWO-PART SERIES

The winter edition of the Council Quarterly featured the first of a two-part interview with Steve Klein, general manager of Snohomish County PUD. Prior to becoming general manager, Klein was the superintendent for Tacoma Power for 13 years.

He has served on many industry boards, often in a leadership capacity, including the Pacific Northwest Utilities Conference Committee, Transmission Issue Group, BPA Administrator's "Kitchen Cabinet," BPA Customer Collaborative, Public Power Council, Northwest Public Power Association, Public Generating Pool, and the Institute of Electrical and Electronics Engineers.

Klein is recognized for creating the concept of "Electricom," which is the integration of advanced telecommunications technology with the electric distribution delivery system. His vision led to the construction and successful operation of the ClickNetwork in Tacoma. He is also a leader in the study and development of renewable energy, having been instrumental in filing the first permits to study tidal power in the Puget Sound area.

In this conclusion, Klein shares his thoughts about adding conservation and renewable resources to the Northwest's power system, nuclear energy, and cap and trade policies.

Q. What do you think about state and national legislation mandating amounts of renewables, and/or conservation? Is it a good thing?

Unfortunately, incentives or directives are sometimes necessary to bring about a large-scale change in behavior. The less we waste today, the more we will have in the future. Conservation and renewables reflect that philosophy, and ultimately make good economic sense, both in the near and long term.

Snohomish PUD is concentrating its efforts on conservation and renewables, regardless of a mandate. We acknowledge that not everyone shares that perspective. But you only have to look at those utilities with strong low-cost resource foundations and some of the lowest rates in the Northwest to see that they are the ones that have invested for the future. Today's renewable resources have expanded beyond hydroelectricity to include other promising sustainable resources. Conservation has also expanded through technology and innovation.

Mandates can be beneficial if they stimulate and nudge us forward, but do not burden us with unnecessary administration and complexity. So far, the mandates are doing what they were designed to do, but I fear impatience on the part of those who want to add more or escalate timeframes, before we have even reached the first existing milestone. I also worry that raising the current near-term portfolio requirements would result in simply more wind generation and divert resources away from developing other promising alternatives. We also need to make sure that we don't create conflicting mandates under the myriad of initiatives associated with local, state, and federal renewable portfolio standards, and overarching national energy policy. The bottom-line answer to the question is, so far so good.

Q. Is nuclear energy an option for the Northwest?

The United States has not built a nuclear plant in decades. The financial markets would be leery of debt financing projects of this size and complexity. The worldwide demand on nuclear engineering and construction expertise is also a limiting factor, as well as equipment availability. In addition, the U.S. has not resolved its waste issues. There is also a strong bias against nuclear in the Northwest. We have limited options to meet some of the more aggressive climate initiatives without the nuclear option. However, I believe nuclear is not a viable option to even consider in the Northwest for at least the next 15 years.

Q. What do you think are the best policy options for achieving reductions in CO2 emissions? Cap and trade? Emissions performance standards? A carbon tax? Efficiency improvements?

In order for a cap and trade approach to work properly and deliver a cost-effective solution to reduce greenhouse gas emissions, it absolutely must have a robust market, as well as precise and exceedingly vigilant protection mechanisms to guard against manipulation and unintended consequences.

Cap and trade essentially creates a market-based tax. Trading allowances through auctions in constrained markets allow prices to go to the highest bidders. This market could be set by the dominant marketers, resulting in consumers paying a tax-

(See *Steve Klein* on page 11)

HIGH-LEVEL INDICATORS WILL TRACK PROJECTS THAT IMPLEMENT FISH AND WILDLIFE PROGRAM

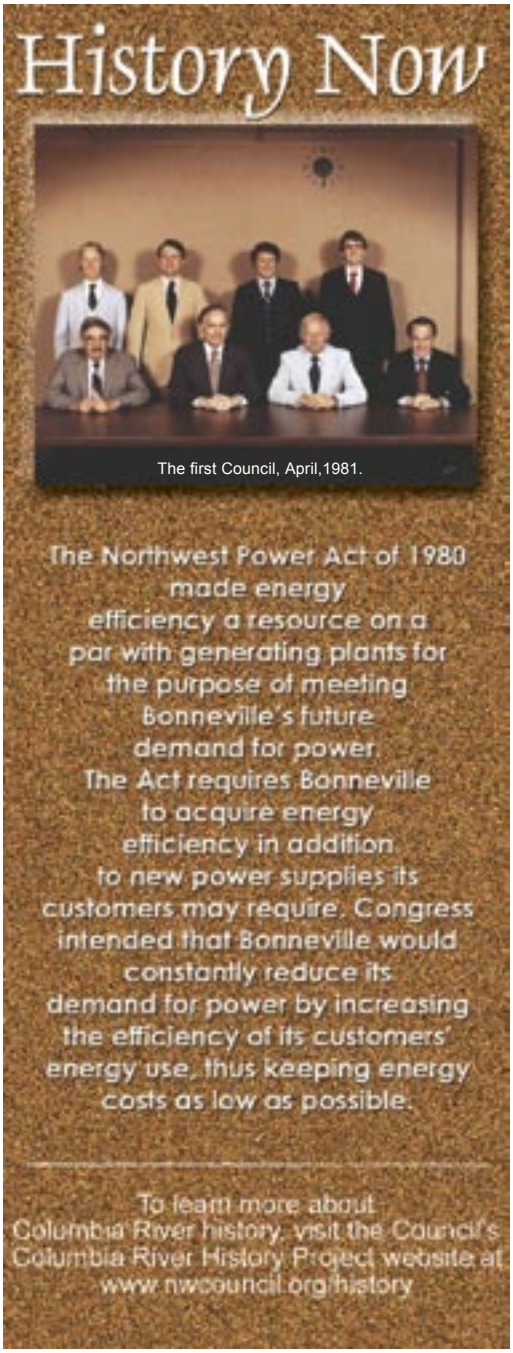
The Northwest Power and Conservation Council is working to improve the accountability of the Columbia River Basin Fish and Wildlife Program. This year, the Council began developing a set of "high-level indicators" to track the accomplishments of projects that implement the program. Indictors are being developed in the general categories of land, water, instream fish-passage, fish-diversion screens, and habitat improvement. Indicators will address the biological, implementation, and management components of projects that implement the program.

When completed, high-level indicators will be used in the Council's annual reports to Congress, the region's governors, and to citizens. Two types of indicators are being developed: biological indicators to measure the biological response to project implementation, and implementation indicators to provide data about activities undertaken through the projects.

The biological indicators include: 1) adult salmon and steelhead returns to the Columbia River and the abundance of adult fish; 2) trends in abundance of Endangered Species Act-listed salmon and steelhead; 3) life-stage survival estimates for representative populations of Chinook and steelhead; 4) harvest numbers and rates, harvest of hatchery fish in the Council's program, and the relative fitness of supplemented stocks from hatcheries in the Council's program; 5) fish-survival rates through the Columbia and Snake river hydrosystem; 6) productivity of wild fish in select watersheds targeted in the Council's program; and 7) lost and acquired wildlife habitat units, by dam.

The implementation indicators include: 1) additional habitat made accessible, such as through removal of barriers to migration and installation of fish-diversion structures; 2) additional water made available for anadromous and resident fish, measured in cubic feet per second; 3) additional land acquired or leased for fish habitat such as through protection of riparian areas, measured in miles or acres; 4) riparian habitat improved, measured in acres; 5) the number of fish-diversion screens installed in water withdrawals for irrigation and other water uses; 6) the number of juvenile salmon and steelhead not consumed by predator birds and fish; and 7) the number and percentage of targeted watersheds with aquatic fish habitat.

The Council's high-level indicators are similar to, but not the same as, indicators used to assess progress of projects funded through the Pacific Coastal Salmon Recovery Fund, which is administered by the National Oceanic and Atmospheric Administration. The Council supports work to better align these two databases. This will require coordination between NOAA and the Bonneville Power Administration, which administers projects that implement the Council's program. CQ



GOOD CONDITIONS (continued from page 2)

Last year, over 300,000 fall Chinook were counted at Bonneville Dam, about the same as in 2006 and an increase from the 2007 count. Hassamer said the upriver — above Bonneville — summer steelhead runs have been fairly consistent since 2002 at around 300,000 fish. Spring Chinook salmon runs, like steelhead, have been fairly consistent for the last four years at around 200,000 fish, he said.

The Columbia River sockeye return in 2008 was exponentially larger than in recent years, with more than 200,000 fish counted at Bonneville, compared to fewer than about 75,000 fish in each of the last three years. The Snake River component was the largest since the mid-1950s. Paul Kline, assistant chief of fisheries for the Fish and Game Department, said sockeye returns should also continue strong this year, with 722 fish predicted to cross Lower Granite Dam. Kline said that based on the number of jacks counted the year before the last big Snake River sockeye return (seven jacks counted in 1999 resulted in 299 adults in 2000), the jack count last year — about 150 — could signal a monster run in 2009.

"I'll go out on a limb and predict 722 adults this year, but I'm being conservative; I anticipate it could even be higher," he said. The Fish and Game Department plans to build a new hatchery to boost sockeye production. The goal is to produce between 500,000 and 1,000,000 sockeye smolts annually. That level of smolt production could yield up to 5,000 returning adult sockeye each year, Kline said.

Bill Tweit, Columbia River policy lead for the Washington Department of Fish and Wildlife, also was optimistic about the 2009 sockeye run, even though the recent success of the species is difficult to explain.

"While the 2008 return to the Columbia was fantastic, it was an anomaly," Tweit said. Most sockeye runs in Puget Sound and even in British Columbia's Fraser River, historically a sockeye factory, were low last year.

"Sockeye appear to use the ocean differently than all the other salmon species; it's worth a closer look," he said.

That difference could be useful in forecasting the size of other salmon runs, since sockeye success or failure in a given year might correlate to the strength or weakness of other runs. Upper Columbia sockeye originate in lakes in both the Wenatchee and Okanagon river basins, but the Wenatchee fish were a small percentage of the big return last year, and the same is expected this year.

"The [Wenatchee component] was around 10 percent of the total, and that's almost a little counterintuitive because the Okanagon has much smaller lakes and is plagued by higher water temperatures, and so on. These fish continue to confound us a bit," he said.

Tweit was optimistic about other salmon and steelhead runs this year — most of them, at least. There are some oddities, however, such as the Willamette River spring Chinook run, which continues to be very depressed. As well, returns to the major Washington tributaries downstream of Bonneville Dam are looking very poor, he said.

"We're just not quite sure what's going on there," he said. "There's probably some kind of ocean signal, maybe an estuary thing as well — the sort of thing we will look forward to exploring further with NOAA."

Upriver spring Chinook runs are continuing to gain strength, both in Columbia River tributaries and in the Snake basin, Tweit said. "We don't seem to be making a lot of forward progress, but we are holding steady at a much higher level than we were in the mid-90s when the runs were very, very poor," he said.

The outlook for summer Chinook in the upper Columbia tributaries is strong again this year, he said. If the forecast proves correct, the runs will comprise the fourth-highest return since the 1960s. These runs are bouncing back from a couple of years of poor returns that were caused, at least partly, by high water temperatures in the tributaries during spawning, he said. This caused pre-spawning mortalities of naturally spawning fish, as well as some ongoing problems with disease in hatchery-origin fish.

Steelhead runs are expected to continue to be stable, and the outlook for fall Chinook salmon is optimistic — a little over 500,000 fish crossing Bonneville Dam. That number might increase a little over the next several years, he said. Upriver bright fall Chinook comprise a little over half of the forecasted 2009 return, and that's good news because it includes the ESA-listed Snake River fish. Meanwhile, the forecast for Spring Creek National Fish Hatchery fall Chinook, which comprise the backbone of ocean fisheries off the coast of Washington, is for a lower return than in 2008 — 59,300 fish this year compared to about 90,000 in 2008. Both numbers are far below the recent high for Spring Creek falls of about 180,000 fish in 2003.

(continued on next page)

Tweit noted that the strength of most spring Chinook runs allowed for recreational fishing in April. Fisheries for fall Chinook and coho are likely later this year.

Overall, Columbia River salmon and steelhead runs are not crashing, and some continue to improve. This suggests that in recent years, at least, ocean conditions for salmon and steelhead that originate in the Columbia River Basin have been consistent and favorable.

John Ferguson, director of the Fish Ecology Division at the NOAA Northwest Fisheries Science Center in Seattle, said the abundance of salmon and steelhead depends directly on feeding conditions in the Pacific Ocean, and as conditions improve or worsen the abundance of salmon rises and falls. He pointed to recent research coordinated by a professor at the University of Alaska that analyzed the concentration of fish bones and scales in ocean-bottom sediment to create a record of fish abundance stretching back 2,200 years. The research suggests that cycles of fish abundance and scarcity are common, and that some of these cycles can last 1,000 years. Research focusing on Snake River sockeye at Redfish Lake showed similar cycles, with a sharp decline in the last 100 years because of human impacts, Ferguson said.

"This is natural variability that salmon have evolved to," he said. "We have to place all of our freshwater activities into that context." He said NOAA's ocean sampling over the last 10 years shows that the state of the ocean generally improved. Test fisheries conducted by NOAA scientists confirmed the good news. "What we saw in the ocean in 2008 were excellent conditions. The ocean was chock-full of food," he said. Only coho salmon numbers were down in NOAA's research fisheries, and it may be that they grew so fast that they had moved father out into the ocean beyond the nearshore test fishery areas, he said.

> **"We can expect from these tidbits of data, higher highs and lower lows in our salmon returns."**
>
> John Ferguson
> Director of
> the Fish Ecology Division, NOAA

All of this suggests that coho, Chinook, and sockeye salmon returns to the Columbia River Basin this year and in 2010 and 2011 should be strong. Following on the big return of sockeye in 2008, NOAA predicts an even larger sockeye return in 2009, 340,000 fish, Ferguson said.

Beyond the next few years, however, the future is more difficult to predict, he said. Based on what can be observed today, the long-range news is not so good.

"Ocean variability seems to be increasing, by what we can tell, and the ocean's going to get warmer," Ferguson said. Ocean temperature varies, producing periods of warm and cold water that can last decades — a term for this phenomenon coined by University of Washington scientists is the Pacific Decadal Oscillation (PDO). "What we've seen since 1925 are 20- to 30-year cycles of this indicator."

The PDO entered a cold regime in 1999, which likely contributed to the big salmon and steelhead returns in 2000 and 2001. But that cold period ended in 2002, replaced by warmer water and poorer feeding conditions through 2003 and much of 2004. The ocean turned cold again that year; it is not clear when it might shift again. This change to rapid variability, compared to the longer time periods of ocean temperature observed from 1925 through 2000, apparently is affecting fish survival in the ocean and the survival of wildlife that feed in the ocean. Ferguson said a study of a Pacific sea bird, Cassin's auklet, shows its breeding success has been highly variable since the early 1980s, apparently in response to the abundance of food fish in the ocean. The same could be expected of salmon and steelhead populations in the future, he said. "We can expect from these tidbits of data, higher highs and lower lows in our salmon returns," he said.

Climate modeling by the University of Washington and NOAA suggests that current trends in ocean temperature point toward a warmer future.

"That will be bad for our salmon," Ferguson said.

What can be done in response?

Ferguson said fish managers will have to account for ocean variability.

"All of our actions are really in freshwater," he said. "We've made a lot of improvements there, but we need to integrate what we do in freshwater with what's going on in the ocean to increase the returns further."

He said hatchery production should be scaled to marine productivity.

"We put out about 150 million smolts a year from our hatcheries whether or not the ocean is good or bad," he said. "Biologically, this doesn't make sense. We're also doing a lot in the river to adjust flow, smolt transportation, and timing to ocean productivity. If we're going to see more variability in the runs, we need to build up more complexity in the habitat for these fish to let them express their life-history diversity, and that includes in the estuary. That will be their key to deal with the change that is coming. We just don't know now what will happen to salmon, but as the ocean warms we know there will be winners and losers out there in the pelagic ecosystem." CQ

REFORMS PROPOSED FOR COLUMBIA RIVER BASIN SALMON AND STEELHEAD HATCHERIES *(cont. from page 1)*

tional practice of replacing natural populations with hatchery fish is not consistent with today's conservation principles and scientific knowledge. Hatchery fish cannot replace lost habitat or the natural populations that rely on that habitat, according to the report. Therefore, hatchery programs must be viewed not as surrogates or replacements for lost habitat, but as tools that can be managed as part of a coordinated strategy to meet watershed or regional resource goals, in concert with actions affecting habitat, harvest rates, water allocation, and other important components of the human environment.

Congressman Norm Dicks, D-Washington.

The HSRG scientists concluded that in order for hatcheries to contribute to harvest on a sustainable basis, they must be operated in a manner that is compatible with fish-conservation goals at the local and regional levels. This means hatcheries must be managed according to basic biological principles and viewed as integral components of the ecosystems they affect.

The most central aspect of this approach involves genetic management. Hatchery broodstocks need to be managed as either genetically segregated from, or integrated with, populations of fish that spawn in the wild. To guide this genetic management, the HSRG developed guidelines for minimum standards that must be met for each type of hatchery program.

The HSRG also recommended that hatchery managers assure that ecological impacts of hatchery structures and operations are minimized and that they meet all regulatory requirements for water withdrawal and discharge, fish passage, and screening of water diversions.

However, the HSRG also concluded that hatchery reforms alone will not achieve recovery of natural populations. Complementary actions taken by harvest, habitat, and hatchery managers are all necessary if conservation goals are to be achieved. The effectiveness of habitat actions will be greatly increased if they are combined with hatchery and harvest reforms. A holistic strategy combining reforms and improvements in habitat, harvest, hatcheries, and hydropower dam operations will be necessary to meet the managers' conservation and harvest goals for salmon and steelhead.

Congress established the project because it recognized the hatchery system was in need of comprehensive reform. With many stocks listed as threatened or endangered under the Endangered Species Act, conservation of salmon was a high priority and many existing hatchery programs were contributing to the risks those stocks were facing.

The HSRG began reviewing all state, tribal, and federal hatchery programs in Puget Sound and Coastal Washington, an effort that concluded in 2004. The following year Congress directed NOAA Fisheries to replicate the project in the Columbia River Basin for hatcheries downstream of Bonneville Dam. The scope was then expanded to include the entire basin, with additional funding provided by the Bonneville Power Administration under the Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program.

The Council plans to consider adopting the HSRG recommendations into the Program. In doing so, the Council will consider, among other things, the U.S. v.Oregon Management Plan, the Pacific Salmon Treaty, tribal trust and treaty rights, and recovery plans.

The HSRG report includes recommendations for each hatchery and production program in the basin. The report is posted at www.hatcheryreform.us CQ

Quarterly Quote

"Above all, do not lose your desire to walk."

Sören Kierkegaard

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like premium to highly capitalized investors and speculators who add no value or environmental enhancements. Instead, these "marketers" look to profit handsomely by taking advantage of supply and demand for a piece of paper deemed an allowance.

Under average conditions, most utilities in the Northwest would have little or no need to purchase allowances in order to fulfill their statutory obligation to serve customers in their service territory. But the situation could arise where along comes the 50-year drought and our hydro-based region is short in a big way, and we must enter the market to dispatch thermal to meet Northwest demand. Now, suddenly, Northwest hydro-based utilities need to acquire allowances.

Those who want to see the region, and ultimately the nation and world, address the global challenge of greenhouse gas do not want to see us make the same mistakes that were made in the early stages of energy deregulation. The deregulation advocates' hasty, but well intentioned, efforts resulted in higher rates for consumers, unbridled market manipulation, and long-term negative effects on jobs and the economy.

While I think an acceptable cap and trade approach could be developed if carefully implemented in verified stages, I prefer addressing the challenge of climate change through direct regulation with transparent mechanisms that provide certainty and allow consumers and businesses to know where their money is going.

This concept provides emission caps that guarantee greenhouse gas reductions without the complexity of an allowance and auction system. The direct regulation approach establishes caps to create demand for reductions, and also allows resourceful and creative entities to produce measurable environmental improvements through new technologies, conservation, renewables, and other innovative applications.

Q. How would Snohomish fare under a cap and trade system?

Under the current definitions, we are assigned responsibility for carbon through our BPA and market purchases. At times when our mostly hydro-based portfolio underperforms due to low water conditions, our carbon exposure will increase proportionately to our market purchases from thermal resources within or outside of the region. So the answer to how we would fare depends on your assumptions about the various potential circumstances.

I do not think Northwest utilities as a whole will fare well under a 100 percent auction when our hydro supply is variable. We have an obligation to serve our customers, and the energy markets and allowance marketers will know the situation we are in. Speculators can buy up the allowances each year waiting for the big payday that comes when the Northwest hydroelectric utilities suddenly run short and must purchase thermal-based resources, along with the appropriate number of expensive allowances.

Q. Do you have any recommendations about how to address these issues in the Council's upcoming Sixth Power Plan?

The Council should help us address our challenges in practical and meaningful ways that avoid creating bureaucracy and unintended hurdles. We should place our trust in the creativity of Northwest entities and allow them to be innovative, and encourage and support that innovation. The Council should also address the issue of resource supply diversity and the lack of research and development of promising renewables and energy storage alternatives.

Under the new regional dialogue paradigm, individual or groups of utilities will play the important roles that BPA once fulfilled. Preserving the value of the region's federal-based hydroelectric system remains crucial. Adding to its importance is its contribution as a renewable resource to solving the climate change challenge.

The Council continues to assign goals and responsibilities to BPA for the regulation, facilitation, and acquisition of the region's conservation. The new and expanding statutory obligations for conservation that now fall directly on some utilities must be acknowledged and dealt with in a way that validates their conservation obligation without placing a duplicate obligation on BPA. BPA will still have a facilitation and acquisition goal for those utilities who seek such assistance, but not for others. The Council can help define BPA's role to serve those who don't have a statutory mandate, but nonetheless want BPA assistance.

The Sixth Power Plan should address the potential acceleration of the electrification of transportation and its impact on Northwest utilities. The Council can also address the potential of electric car batteries feeding the grid, assessing the preparedness of Northwest utilities to actually integrate electric vehicles into the grid, including the need for applications to interface with system operations and accounting.

Legislators, regulators, and appointed policymakers need to look at all these challenges from a strategic perspective. Right now, we have an ever-increasing amount of redundant or conflicting mandates with complex administrative processes placed primarily on the electric power industry. The Northwest is unique in that it has a Power Act that was farsighted in recognizing the value of conservation and renewables. While we have many challenges, our hydroelectric system and the progressive elements of the Act have placed the Northwest far ahead of the rest of the country in terms of conservation, environmental protection, and renewables development. As a result, the region has a comparatively low carbon footprint. We should feel good about our past accomplishments and continue to think strategically about our future. CQ

Northwest Power and Conservation Council Members

Central Office
Northwest Power and
Conservation Council
851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
Telephone: 503-222-5161
Toll Free: 1-800-452-5161

Idaho
Boise
450 West State
Boise, Idaho 83720-0062
Telephone: 208-334-6970
Council Member:
James A. Yost

Hayden Lake
East 1677 Miles Ave., Suite 103
Hayden Lake, Idaho 83835-9154
(208) 334- 6970
Council Member:
W. Bill Booth, Council Chair

Montana
1301 Lockey
Helena, Montana 59620-0805
Telephone: 406-444-3952
Council Members:
Bruce Measure, Council Vice Chair
Rhonda Whiting

Oregon
Astoria:
1642 Franklin Ave.
Astoria, Oregon 97103
Telephone: 503-325-2006
Council Member:
Joan M. Dukes

Milton-Freewater:
P.O. Box 645
Milton-Freewater Oregon 97862-0645
Telephone: 541-938-5333
Council Member:
Melinda S. Eden

Portland:
851 S.W. Sixth Avenue, Suite 1020
Portland, Oregon 97204-1347
Telephone: 503-229-5171

Washington
Spokane:
N. 501 Riverpoint Blvd, Suite 425
Spokane, Washington 99202
Telephone: 509-359-2438
Council Member:
Tom Karier

Lacey:
510 Desmond Drive SE Suite 271
Lacey, Washington 98503-1273
Telephone: 360-534-9347
Council Member:
Dick Wallace

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Northwest Power and Conservation Council

851 S.W. Sixth Avenue
Suite 1100
Portland, Oregon 97204

Telephone: 503-222-5161
Toll free: 800-452-5161
Web site: www.nwcouncil.org

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