

*Striking a Balance Between Energy and the Environment in the Columbia River Basin*

## The Northwest's CO<sub>2</sub> Footprint: Determining the Impact, and the Difficulty in Trying to Lessen It



esponding to increasing concerns about climate change and the role of greenhouse gases like carbon dioxide (CO<sub>2</sub>) to this process, the Northwest Power and Conservation Council released in the fall an analysis of the region's power system CO<sub>2</sub> footprint.

The analysis, which was released for public comment, compares 2005 CO<sub>2</sub> production to 1990 levels, and to forecast future levels from alternative resource portfolios. The years 1990 and 2005 were

Actual CO<sub>2</sub> production in 2005 is estimated to have been about 67 million tons, a 52 percent increase over the estimated 1990 production of 44 million tons. But because 2005, unlike 1990, was a poor water year, emissions went up as more fossil-fueled plants were dispatched to make up for the absent hydropower. Had 2005 been a normal water year, the estimated production would have been 57 million tons, a 30 percent increase over 1990.

The base case is the resource portfolio recommended in the Council's Fifth Power Plan. The alternative scenarios

include a low conservation scenario in which the conservation targets of the Fifth Power Plan are not achieved and a high renewables scenario based on state renew-

Perhaps the most sobering finding of the analysis, however, is that it will be extremely difficult to reduce CO<sub>2</sub> emissions to 1990 levels.

"This report highlights the challenges facing the region in trying to control CO<sub>2</sub> emissions from the power system," Council Chair Tom Karier said. "It will be a tremendous challenge just to keep CO<sub>2</sub> emissions at current levels."

The Pacific Northwest's power system, dominated as it is by hydroelectric power, generates much less CO<sub>2</sub> than other parts

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chosen because they serve as baselines for CO<sub>2</sub> reduction targets in many climate change policy proposals, including the Western Climate Initiative, Washington Governor Christine Gregoire's climate change executive order, and Oregon's House Bill 3543.

able energy portfolio standards. The analysis also looked at how removing the federal dams on the lower Snake River and how summer spill at the lower Snake and lower Columbia rivers affects CO<sub>2</sub> production.

### What's Inside

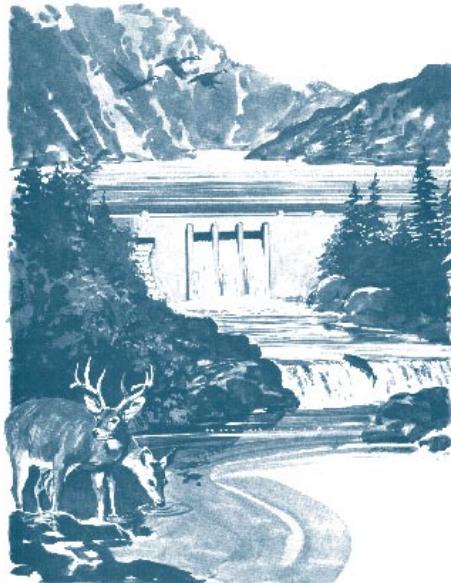
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# Council Begins Amendment of Fish and Wildlife Program

In November, the Council began a year-long public process to amend its Columbia River Basin Fish and Wildlife Program, one of the biggest fish and wildlife recovery efforts in the United States.

Through the program, the Council and the Bonneville Power Administration direct more than \$140 million per year to projects that mitigate the impacts of hydropower dams on fish and wildlife. The projects address a wide range of impacts, including improving spawning and rearing habitat for fish, raising fish in hatcheries for release in the wild, acquiring land as wildlife habitat, and funding research into key scientific uncertainties. The program is unique because it is funded largely by electricity ratepayers and addresses all fish and wildlife affected by hydropower, including threatened and endangered species.

Under the authority of the Northwest Power Act of 1980, the Council develops the program based on the recommendations of state, federal, and tribal fish and wildlife managers, and interested citizens.



**Call For Recommendations to amend the Columbia River Basin Fish and Wildlife Program**

occurred in 2003-2005 when the Council incorporated into the program specific recommendations for mainstem Columbia and Snake river dam operations, and 57 subbasin plans. Subbasin plans will guide future implementation of the program.

The amendment process began on November 1 with a formal request for recommendations, as required by the Power Act. The deadline for submitting recommendations is February 1, 2008. The Council then will review the amendment proposals, prepare a draft amended program for public review and comment, and finalize the new program by November 2008.

Information about the amendment process is posted on the Council's website at [www.nwcouncil.org/amend](http://www.nwcouncil.org/amend).



Bonneville implements the program and funds it with a portion of the revenue from the sale of hydroelectricity generated at 31 federal dams in the Columbia basin. The Power Act requires the Council to review the program at least every five years. The last review and amendment



## Notes From the Chair

The wildfires that ravaged Southern California this fall brought into sharp relief the price of human development near public forestland. As the Washington Post noted, "Two of four counties—San Bernardino and Riverside—burning most fiercely this week are among the fastest-growing in the United States, bedroom communities that push what ecologists call the 'urban/wildland interface.'" But it's not just the Southwest that is experiencing a persistent drought; so, surprisingly, is the Southeast. A New York Times story published the same time as California's wildfires noted that "The drought has afflicted most of the Southeast, a region that is accustomed to abundant water and that tends to view mandatory restrictions as government meddling." Why talk about the Southwest and the Southeast? Because the conditions plaguing those regions—a growing population colliding with the environment and increased risks from a changing climate—may foreshadow and reflect our own.

What strikes me are the similarities, and the crucial differences. In the summer 2007 edition of the Council Quarterly, we reported on the Independent Scientific Advisory Board's analysis of the impact of population growth on fish and wildlife in the Columbia River Basin. The report notes that one of the most significant changes has been rapid growth in formerly undeveloped, scenic areas, not unlike what California is experiencing.

For a generation now, the Pacific Northwest has worked collaboratively to think about, and plan for, our future energy needs and the needs of fish and wildlife. This pattern is the legacy of the Northwest Power Act, a deliberate, affirmative step to address the challenge of reconciling energy and the environment. It is a pattern unique in the country, and perhaps the world.

As we see today, and as scientists warn, the trend is toward intensifying conflict. In our favor is this past history of regional planning and cooperation. But the past does not presume success. We should remind ourselves that we are keepers of a vision, a vision that is renewed and made relevant through our efforts to fulfill it.

# Scientists Share Latest Research Results with Fish and Wildlife Policy-makers

**A**bout 100 scientists and fish and wildlife policy-makers gathered at Portland State University in September to share information about the current state of science in preparation for revising the largest fish and wildlife improvement program in the Northwest.

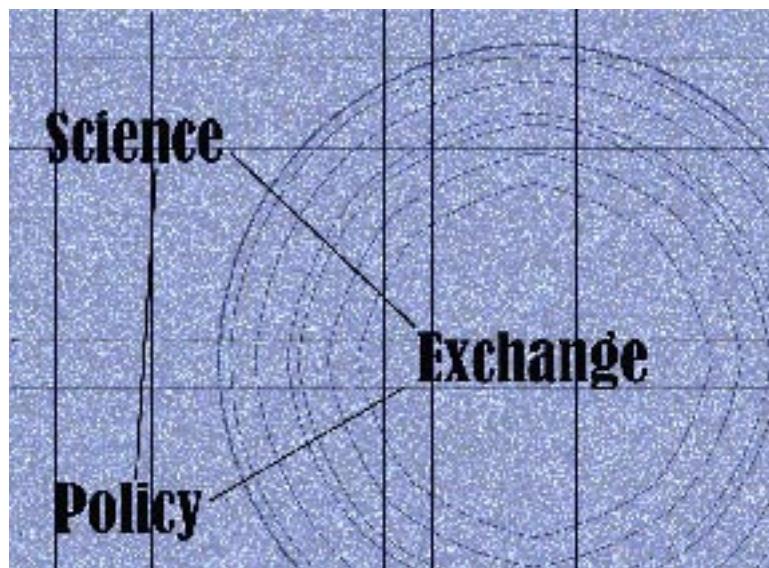
The Science/Policy Exchange, hosted by the Northwest Power and Conservation Council, focused on the current state of scientific knowledge about salmon and steelhead in some of the thorniest fish and wildlife policy issues of the day: the efficacy of freshwater habitat restoration; survival of salmon and steelhead past the hydroelectric dams on the Columbia and Snake rivers; survival of salmon and steelhead in the Columbia River estuary; and survival in the Pacific Ocean. The Council will begin a year-long revision of its Columbia River Basin Fish and Wildlife Program in November. The Council revises the program every five years.

"The Northwest Power Act says that we are to use the best available scientific knowledge when we amend our program, and that is what this conference is all about—learning the current state of fish and wildlife science in matters that are critical to our fish and wildlife program," said Council Chair Tom Kariel. "There is a lot of uncertainty about this science, and we need to explore those uncertainties. We're policy people; it is a challenge to translate science to policy."

Rick Williams, a scientist from Eagle, Idaho, moderated the two-day exchange. Williams, a former chair of the Council's Independent Scientific Review Panel and an expert in population and evolutionary genetics and ecology, said the need to reflect science in policy "has beleaguered us for years.

"That's why we're here—to understand how science has evolved and how that should affect the fish and wildlife program," he said.

The Science/Policy Exchange included presentations by 18 scientists from state, federal, and Canadian fish and wildlife agencies, Indian tribes, and the Council. Abstracts of the presentations are posted



on the Council's website, [www.nwcouncil.org](http://www.nwcouncil.org). Some of the key points of the presentations included:

## Habitat:

- Robert Bilby, an aquatic ecologist with the Weyerhaeuser Company, and Gordon Reeves of the Corvallis office of the U.S. Forest Service Pacific Northwest Research Station, discussed a new concept in monitoring the response of salmon and steelhead to changes in spawning and rearing habitat. The technique shows promise of accelerating scientific understanding, which would help policy makers pick projects that have the greatest chance of success. The concept is known as intensively monitored watersheds. By concentrating monitoring of habitat restoration in a small number of watersheds in Washington, Oregon, and Idaho, scientists should be able to detect a significant

response in the production of salmon smolts in about 10 years as opposed to as long as 30 years for less intensive monitoring, Bilby said. Importantly, though, results in terms of a biological response will take time to understand.

- Susan Hannah, a professor of marine economics at Oregon State University, and Peter Paquet, manager of wildlife and resident fish for the Council, suggested it is time to rethink an important assumption in the fish and wildlife program—that human population and climate will remain stable over time. In fact, population is growing, the climate is changing, and this introduces major uncertainties into habitat restoration strategies. For example, some 40 percent of the John Day River Basin in Oregon is at an elevation that will lose snowpack in the future as

the result of climate change. The message for policy-makers is that habitat with high ecological value but that also is most sensitive to impacts from climate change and population growth should have priority for conservation and mitigation actions.

## Fish survival at the hydro-power dams in the mainstem Columbia and Snake rivers:

- Bill Muir, a Fisheries Service biologist who takes part in the agency's juvenile fish survival research, said the estimated survival of spring-migrating juvenile fish through the eight dams of the lower Snake and Columbia rivers in the spring of 2007 was 56 percent for Chinook salmon and 39.2 percent for steelhead. Despite low flow volumes this year, compared to flows since 1993, the survival estimates are only a little lower than the estimated

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# Scientists Share Latest Research Results

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survivals in 2006, which was a high-flow year, and the 2007 estimates were considerably higher than in 2004, which also was a low-flow year. However, he said the research also showed that high survival through the hydropower system does not necessarily equate to high returns to adult fish. "Just because fish survive passage through the dams doesn't mean the battle is won," he said. "There are other things that affect whether the fish return as adults, such as conditions in the estuary."

- Fisheries Service research on adult salmon and steelhead shows that survival past all of the dams can reach 95 percent under ideal conditions, and fall as low as 65 percent for stocks that are fished heavily. Survival also varies seasonally, annually, and by species. The research suggests that spilling water over dams, which helps juvenile fish migrate downstream, can delay adult fish returning up the river, particularly when spill volumes are high.

The research also suggests that a lower percentage of fish that were barged downriver as juveniles return as adults, compared to juvenile fish that were not barged. Poor passage conditions through the hydropower system, such as high water temperatures or fallback (this is when adult fish pass a dam but get pushed back through the dam by the current and have to climb the ladder again), can decrease survival farther upstream, perhaps because the fish expend so much energy passing the dams.

- Howard Schaller of the U.S. Fish and Wildlife Service and Charlie Petrosky of the Idaho Department of Fish and Game studied the survival of juvenile Snake River salmon and steelhead. Their research suggests that spring Chinook and steelhead from the Snake River survive only one-fourth to one-third as well as spring Chinook and steelhead from the lower Columbia River area. Water travel time appears to be the key, Schaller said. The hydropower system has slowed

"That's why we're here—to understand how science has evolved and how that should affect the fish and wildlife program."

Rick Williams  
**Former Chair**  
**Independent Scientific Review Panel**

the migration rate for all salmon and steelhead, with those traveling the farthest being the most affected, he said. "There are influences of the hydropower system that manifest themselves late—you see survival going down, and this can be explained by what happens in the hydro-system, modified by what happens in the ocean with temperature patterns and upwelling," Schaller said. "You have to take all of these into account when you evaluate survival."

## Columbia River Estuary

One of the many scientific uncertainties of the salmon life cycle is how well juvenile fish survive their transit through the lower Columbia River from Bonneville Dam to the mouth of the river, a distance of about 145 miles. Saltwater and freshwater mix through almost that entire length.

- John Ferguson of the National Marine Fisheries Service's Northwest Fisheries Science Center in Seattle said research in 2005 and 2006 showed the average survival of yearling Chinook salmon through that stretch of the river was 69 percent, and 50 percent for subyearling Chinook. He said one possible reason for the lower survival of subyearling Chinook is predation by northern pikeminnow, which are prevalent upstream from Bonneville and may be more abundant downstream of the dam than previously believed.

Ferguson said the focus of the research is to determine what habitats the fish select in the estuary, how long they remain in those places and, if they die between detection points, how they died. One interesting observation from the research is that survival of juvenile salmon and steelhead is about the same between Bonneville Dam and the estuary as it is between Lower Granite and Bonneville dams. Between Lower Granite and Bonneville, the fish have to pass eight dams; between Bonneville and the estuary there are no dams. Ferguson said survival of yearling Chinook between Lower Granite and Bonneville dams in 2005 was 58 percent, and 64 percent in 2006. Between Bonneville Dam and the estuary, survival was 69 percent in 2005 and 68 percent in 2006.

Predation on juvenile salmon and steelhead by Caspian terns and double-breasted cormorants is a continuing and, for some species, a growing problem, said Donald Lyons, a Ph.D. candidate at Oregon State University who has been researching predation by birds in the estuary. Lyons said the successful relocation of the large Caspian tern nesting colony in the Columbia River estuary from Rice Island downstream to East Sand Island reduced predation by terns on salmon and steelhead in the Rice Island area. The distance from Rice Island, which is upriver from Astoria, to East Sand Island, which is closer to the mouth of the river, is about nine miles. Before the relocation, between 1997 and 1999, terns consumed an estimated 4.8 percent to 10.3 percent of all juvenile Chinook and coho salmon, and steelhead, in the estuary. Between 2000 and 2006, the number declined to 3.2 percent to 5.5 percent. By further dispersing the terns, predation could drop to about 2 percent, Lyons said. This could be accomplished by making potential nesting sites less attractive to the birds, encouraging them to nest away from the Columbia. Terns prefer to nest on open

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sand, and so planting beach grasses or erecting visual barriers—fences, for example—can effectively discourage nesting.

Predation by double-breasted cormorants, however, is more problematic, Lyons said, as these birds will nest practically anywhere and, unlike terns, can dive into the water to chase prey. Only 100-200 cormorants were in the estuary in 1980, but today the number is more than 28,000. While the tern population appears to have stabilized at about 18,000 birds, the cormorant population is increasing, he said. The reason is not clear, but it may have to do with several factors: available habitat, abundant prey, and the ban on pesticides such as DDT that once contaminated Columbia River water and affected egg growth of cormorants and other birds in the estuary. Cormorants nest and feed in the estuary at about the same time of year as terns, from late spring through late summer.

- Estuary research also has addressed the importance of rearing habitat for salmon and steelhead, particularly for subyearling Chinook, reported Daniel Bottom of the Northwest Fisheries Science Center office in Newport, Oregon. Small subyearling Chinook salmon, such as fall Chinook that hatch in the lower Columbia River, seek shallow-water rearing habitats and occupy a diversity of shrub and forested wetlands throughout the tidal freshwater and brackish backwater areas of the estuary, Bottom said. The fish will live in these habitats for weeks or months before entering the ocean. The loss of tidal wetlands could limit the capacity of food webs in the estuary to support juvenile salmon. The fish eat insects that are produced in wetland habitats. The fish using these habitats are not just those hatched in the lower river, but salmon and steelhead from the upper Columbia River and the Snake River that also reside in the estuary before going to the ocean. Factors that will affect the availability of estu-

“Much of the mortality of salmon occurs in the ocean, and growth and survival vary depending on conditions that prevail during early life. . .”

William Pearcy  
**Emeritus Professor of Marine Biology**  
**Oregon State University**

ary habitat include loss of wetlands, the numbers and timing of fish releases from hatcheries, and flow regulation and water temperature impacts that result from hydropower dam operations.

A message for policy-makers, Bottom said, is that recovery of salmon and steelhead will require that sufficient habitat in the estuary is available to support salmon that arrive from throughout the Columbia River Basin.

- Since Euro-Americans began to settle in the estuary in the mid-1800s, the amount of salmon habitat has declined by 50 percent on average, and in some areas by as much as 75 percent, said Deborah Marriott, director of the Lower Columbia River Estuary Partnership. Efforts to restore habitat and gain a better understanding of the impacts of contaminants in the lower river and estuary have been ongoing since 1999, funded by state and federal agencies, much of it through the Council's fish and wildlife program. More than 122 projects have been undertaken and nearly 13,000 acres of habitat restored, Marriott said. Projects have included land acquisitions, tide gate removal and retrofits, breaching dikes and berms, removing pile dikes, revegetating habitat areas, and assessing wetland habitats.

## The Ocean

Prior to the 1970s, scientists generally believed that the Pacific Ocean had an

unlimited capacity to support salmon and steelhead, but in that decade major changes in ocean temperatures caused a radical re-thinking of the old assumption and spurred research that continues to this day. In 1976-77, an influx of warm water from the south overrode cool water near the ocean surface, disrupting the cool-water upwelling that supports the growth of food organisms for juvenile salmon and steelhead. Then in 1982-83 a strong El Niño event further disrupted the ocean environment in a similar fashion. The result was a kind of desert for salmon and steelhead off the coasts of Oregon and Washington. As well, the warmer water attracted predator fish to migrate north from the ocean off California and Mexico.

In addition to impacts from climate changes, predation by sea birds, including sooty shoalwaters and common murres, also is a problem for juvenile salmon and steelhead, particularly in the area where the freshwater plume from the river merges with saltwater beyond the mouth of the river. Disease, perhaps exacerbated by warmer waters, is another problem, and one that needs further research.

Research over the last 20 years has resulted in a better understanding of the warm-water phenomenon—not its cause, but its impacts and timing. The warm-water appears to alternate with cold-water in decades-long cycles. Warm-water cycles are bad for fish from the Columbia River Basin, and cold-water cycles are good in terms of feeding conditions in the ocean.

- William Pearcy, an emeritus professor of marine biology at Oregon State University said survival of juvenile salmon and the number of adult salmon that return to spawn “often are well-correlated with the intensity and timing of coastal upwelling.” The take-home message, he said, is that “much of the mortality of salmon occurs in the ocean, and growth and survival

# Council Recommends Five Projects That Will Test Innovative Techniques To Improve Fish Survival

**F**ive projects intended to demonstrate innovative techniques for improving fish and wildlife habitat and survival will be funded over the next three years after being selected by the Northwest Power and Conservation Council in September from among 59 proposals. The budget for the five projects totals \$2.4 million, which will come from the Bonneville Power Administration.

Earlier this year, the Council and Bonneville jointly invited the public to submit innovative fish and wildlife project proposals to be considered for funding by Bonneville during Fiscal Years 2007-09. In response to a recommendation from the Independent Scientific Review Panel (ISRP), which reviews projects proposed for implementation through the Council's Columbia River basin Fish and Wildlife Program, the Council had asked Bonneville to reserve funding for innovative projects. The purpose of funding innovative projects is to improve knowledge, encourage creative thinking, and provide an opportunity for project sponsors to submit proposals that focus on testing new methods and technologies designed to directly benefit fish and wildlife.

The ISRP reviewed all of the project proposals and reported to the Council. The Council subsequently recommended five to Bonneville for funding to fit within the available budget. Bonneville set aside \$2 million for innovative projects within the \$458 million, three-year funding cycle for the program; the additional \$400,000 will come from money that was not spent during the previous funding cycle and was carried over to the 2007-2009 period

The five projects include:

## **Improving fish habitat by neutralizing contaminated sediments:**

Rather than physically removing contaminated sediments from rivers and streams, the chemical contaminants in the sediment might be effectively neutralized through chemical reactions. The project will test the use of a chemical that will react with creosote in sediment in a portion of the St. Joe River, a tributary of Lake Coeur d'Alene, Idaho. The reaction will release oxygen into the water. The sponsor is Washington State University.

## **Testing a non-lethal means of deterring sea lions from eating salmon and steelhead:**

The project will test a passive, integrated electric barrier and sonar array that is designed to haze marine mammals like sea lions away from areas where adult salmon and steelhead migrate. If successful, the technology could be tried in the tailrace of Bonneville Dam, where sea lions feast on salmon and steelhead in the spring and summer. The proposal calls for the technology to be tested in a Columbia River tributary—the Willamette is one potential test site—before being attempted on the much-larger Columbia. The project sponsor is Smith-Root, Inc., of Vancouver, Washington.

## **Restoring eelgrass in fish habitat in the Columbia River estuary:**

Stands of eelgrass in the marshy channels and backwaters of the estuary provide important rearing habitat for juvenile salmon and steelhead. Strong flows in the Columbia likely limit the success of eelgrass seed dispersal and the establishment of new stands. The project will test innovative site-selection techniques that could help biologists target the high-

est-potential sites to plant eelgrass and restore habitat. The project sponsor is the Pacific Northwest Laboratory in Sequim, Washington.

## **Enhancing summer instream flows and reducing water temperatures:**

This project will investigate the flow and release of water to a stream in an agricultural area under different land-management practices. The purpose is to document the difference in infiltration rates as a function of the number of years that no-till farming has been practiced as opposed to traditional tilling. In no-till farming, seeds are injected directly into the ground. Because the ground is not otherwise disturbed, no-till areas tend to be less-prone to erosion, which can damage fish-spawning habitat. The study will be conducted in the Pataha Creek watershed by Washington State University

## **Testing a device that boosts river flows to guide fish:**

Natural Solutions, a business based in Helena, Montana, will test a mechanical device it developed that boosts the velocity and turbulence of flowing water to determine whether the device could effectively guide smolts to reservoirs behind dams. The theory is that mechanically induced turbulent flows could be used to guide juvenile fish to bypass and collection systems at dams, to guide adult fish away from turbine entrances (to avoid fallback), and to guide fish through slow-moving areas of a reservoir." 

# Scientists Share Latest Research Results

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vary depending on conditions that prevail during early life within a year, among years, and among decades."

• Ed Casillas of the Fisheries Science Center in Seattle said assessing the physical and biological conditions in the ocean off the coasts of Oregon and Washington is helping to improve understanding of impacts on salmon and steelhead. This information can be used to forecast how changing ocean conditions and future climate change will affect salmon. "Understanding how ocean conditions affect juvenile salmon survival and eventual adult returns is necessary in order to manage and assess the benefit of freshwater actions taken to recover and rebuild endangered salmon populations," he said.

• Kate Myers, principal investigator in the High Seas Salmon Research Program at the University of Washington, said the key findings from a number of salmon research projects in the ocean are that 1) biodiversity in freshwater and ocean life histories makes Columbia River salmon resilient to changes in the ocean that affect their survival; 2) Columbia River salmon species, life-history types, and specific populations have different ocean distribution and migration patterns, which means they experience different ocean conditions; 3) comprehensive fish-tagging strategies can provide information needed to improve high-seas fisheries management.

A message for policymakers is that because the ocean has limited capacity to support salmon and steelhead, and because these conditions vary from year to year, it is important to not overwhelm wild fish in the ocean with hatchery fish when ocean feeding conditions are poor. This means that hatchery production should be adjusted to account for ocean conditions. The challenge will be to have the information about ocean conditions far enough in advance—at least two years—to adjust hatchery production schedules.

## Other policy recommendations included:

- Harvest rates could be adjusted in response to conditions in the ocean to take fewer fish when conditions are poor and it is likely that fewer fish are available.
- While the future cannot be predicted, salmon management strategies that ignore the effects of changing ocean conditions on Columbia River salmon are likely to fail.
- Critical ocean habitats could be identified in order to plan for the future effects of climate change.
- Fish-transportation and spill operations could be improved to maximize early ocean survival of salmon.
- Strategies could be planned to meet escapement goals using stock-specific estimates of early ocean survival and abundance. CQ

## Quarterly Quote

**"Nothing in man is more serious than his sense of humor; it is the sign that he wants all the truth."**

Mark Van Doran

## James A. Yost Named to Council



Governor C.L. "Butch" Otter has appointed James A. Yost, a long-time gubernatorial adviser on natural resources issues, to succeed Jim Kempton as one of two Idaho members of the Northwest Power and Conservation Council.

Kempton is leaving the Council to fill a vacancy on the three-member Idaho Public Utilities Commission left by Governor Otter's appointment of PUC President Paul Kjellander to lead the new state Office of Energy Resources. Yost will join Bill Booth of Coeur d'Alene as Idaho's members.

"Jim Yost is a knowledgeable, experienced and trusted hand on natural resources issues, especially when it comes to anything involving water and power. He's an ideal choice for this assignment, and I'm pleased that he's willing to accept it," Governor Otter said. "Jim will bring savvy, energy and a unique perspective to the council that will serve Idahoans well."

Yost, 59, is a Rupert native who was educated at the College of Southern Idaho in Twin Falls and Boise State University. He previously worked for Union Pacific Railroad and the Idaho Farm Bureau, and served two terms in the Idaho Senate representing the Magic Valley's North Side.

He became a natural resources adviser to Governor Phil Batt in 1995. He later served Governors Dirk Kempthorne and Jim Risch in the same capacity, and has been a project manager since Governor Otter took office in January. CQ

# The Northwest's CO<sub>2</sub> Footprint

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of the country. In 2005, under normal water conditions, the region would have produced about 520 pounds of CO<sub>2</sub> for each megawatt-hour of electricity generated compared to 900 pounds for the entire Western interconnected power system. The margin for improvement is much narrower as a result.

In its Fifth Power Plan, the Council recommended aggressive and sustained development of conservation, wind power, and other cost-effective renewables and cogeneration to meet its future load growth. Yet the analysis found that even if the Council's targets were met, the Northwest's CO<sub>2</sub> emission rate would still rise to 67 million tons by 2024, an 18 percent increase over normalized 2005 levels and a 52 percent increase over 1990.

Achieving only 70 percent of the Fifth Power Plan's recommended level of conservation would increase 2024 CO<sub>2</sub> production to 71 million tons, a 61 percent

"This report highlights the challenges facing the region in trying to control CO<sub>2</sub> emissions from the power system . . ."

Tom Karier  
Council Chair

efforts to reduce or even stabilize CO<sub>2</sub> production beyond 2005 will likely require replacing existing coal-fired power plants with low-emitting resources," states the report.

"It's the coal plants," says Jeff King, senior resource analyst. "They're the biggest contributors to the region's power system production of CO<sub>2</sub> emissions."

For the scenario in which the federal dams on the lower Snake River are removed, the lost hydropower is replaced primarily with additional electricity from new and existing natural gas plants, increasing the average annual CO<sub>2</sub> production. By 2024, the amount of CO<sub>2</sub> produced would reach 70 million tons, a 59 percent increase over the 1990 rate.

increase over the 1990 rate. Conversely, regionwide implementation of renewable portfolio standards would reduce the 2024 rate to 63 million tons, a 43 percent increase over 1990 levels.

Though the aggressive acquisition of conservation and renewable resources called for in the Fifth Power Plan will hold the rate of growth in Northwest CO<sub>2</sub> production to half the growth rate experienced from 1990 through 2004, serious

Summer spill operations at the lower Snake River and lower Columbia River intended to help the downstream migration of anadromous fish also have a significant effect on the production of CO<sub>2</sub>.

Historical and projected CO<sub>2</sub> production and effects of alternative scenarios.

	Northwest Sources	WECC Sources
<b>Historical values</b>		
Actual 1990	44	Not estimated
Actual 2005	67	Not estimated
Simulated 2005 w/average hydro	57	378
<b>Forecast 2024 rates and change from Base Case</b>		
Base Case (5 <sup>th</sup> Plan Portfolio)	67	531
Low Conservation	71 (+4.4)	536 (+5.2)
High Renewables	63 (-4.2)	526 (-5.1)
Remove LSR Projects, Replace w/Gas Generation	70 (+3.6)	536 (+4.4)
No Summer Spill	66 (-1.1)	529 (-2.4)
Court-ordered Spill	67 (+0.5)	533 (+1.5)

These results illustrate the difficulty of actually reducing CO<sub>2</sub> production with policies that affect only new sources of electric generation. CO<sub>2</sub> production from electricity generation is dominated by existing coal-fired generating plants. To stabilize CO<sub>2</sub> production at 2005 levels or to reduce CO<sub>2</sub> production to 1990 levels would require substituting low CO<sub>2</sub>-producing resources or additional conservation for some of these existing coal-fired power plants. In addition, the scenario analysis shows that policy choices that are made for purposes other than CO<sub>2</sub> reduction (in this case fish and wildlife policy) can also have significant effects on CO<sub>2</sub> production; enough effect to negate policies such as renewable portfolio standards. Such unintended effects often go unexplored in important policy debates that focus narrowly on only one objective.

## The Northwest's CO<sub>2</sub> Footprint

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Without summer spill, the average annual production of CO<sub>2</sub> in 2024 would be 66 million tons, a 50 percent increase over 1990. Court-ordered spill increases the average annual production of CO<sub>2</sub> for 2024, but only by .5 million tons compared to current operations.

Still, the overall impact of these changes is modest when compared to the region's forecasted rate of production. As the report notes, "The effects of these scenarios, positive or negative, on CO<sub>2</sub> production are the equivalent of only one or

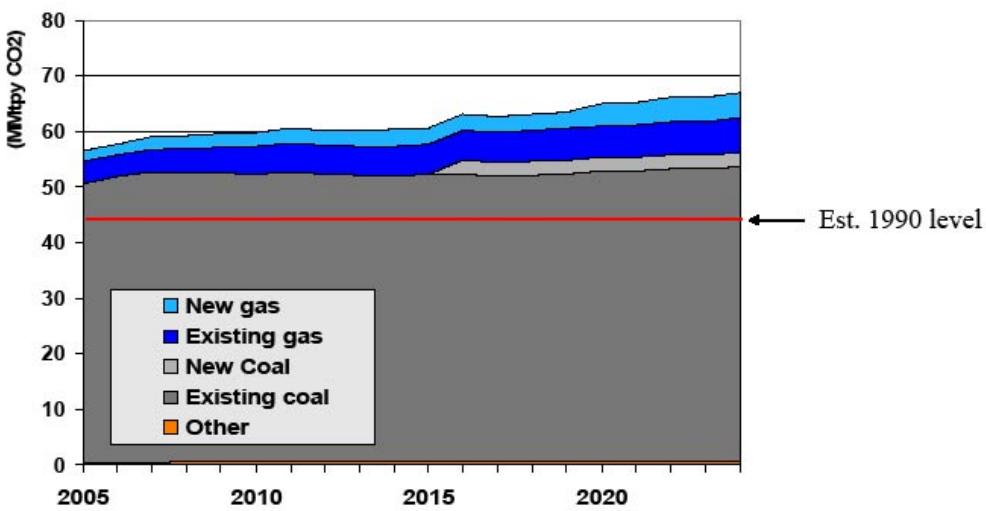
two coal-fired plants, whereas the forecast regional CO<sub>2</sub> production for 2024 in the Fifth Power Plan case exceeds 1990 levels by an amount equivalent to eight typical coal-fired plants."

So, how can the region reduce its CO<sub>2</sub> emissions? The Council's report suggests some possible options:

- Expand the supply of cost-effective energy-efficiency measures
- Improve existing low-carbon generating resources
- Expand new renewable generation
- Improve the efficiency of new fossil generation
- Develop CO<sub>2</sub> capture technology for all forms of fossil generation
- Explore the viability of new nuclear generation

"Our analysis shows that reducing the region's production of CO<sub>2</sub> will be difficult," says Terry Morlan, power division director. "It's one of the challenges we'll be addressing in greater depth in the next power plan." For more information on the report, visit [www.nwcouncil.org](http://www.nwcouncil.org).

CQ



Reduction of CO<sub>2</sub> production to, or below, the 1990 level (the goal of many climate control policies) will require substitution of low-CO<sub>2</sub> resources for existing thermal plants.

# Success Stories – Sagebrush Flats

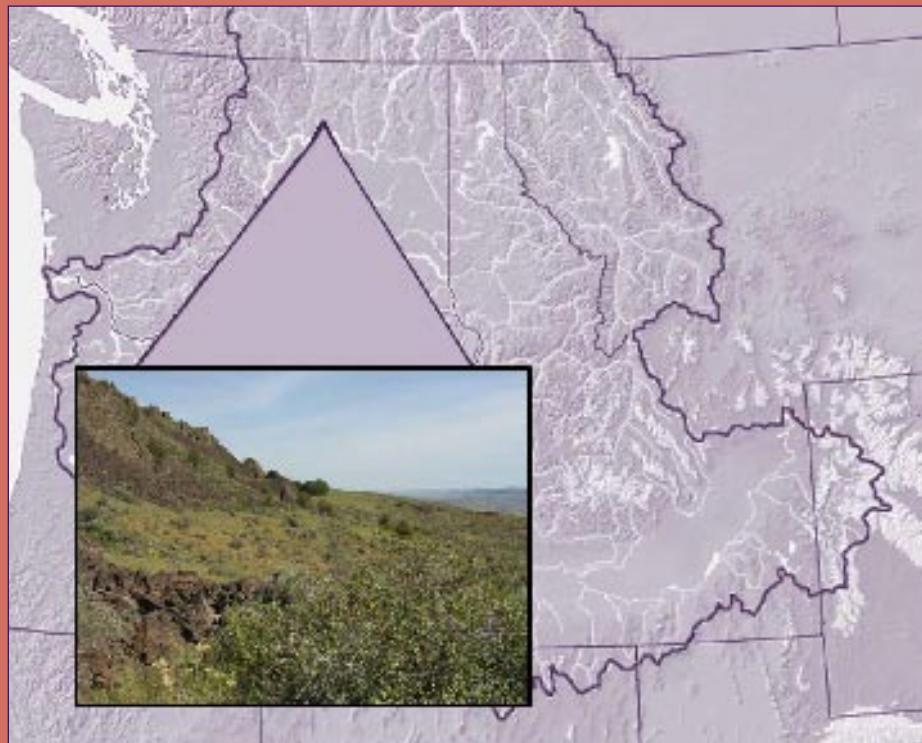
*Central Washington refuge provides Habitat for grouse, pygmy rabbits*

**O**n the dry plateau of central Washington state, habitat for pygmy rabbits, grouse, and other birds and animals that inhabit the dry country above the Columbia River is being protected as partial mitigation for habitat that was lost with the construction and operation of hydropower dams, particularly Grand Coulee and Chief Joseph.

The 12,533-acre Sagebrush Flats Wildlife Area is located northwest of Ephrata and is managed by the Washington Department of Fish and Wildlife (WDFW). The land was acquired through the Council's Columbia River Basin Fish and Wildlife Program.

The purpose of the mitigation project is to protect and enhance existing shrub/steppe and riparian habitat and restore former agricultural fields as wildlife habitat with native vegetation. This restoration is a key goal in the Council's Upper Middle Mainstem Columbia Sub-basin Plan. In addition to mitigating for the impacts of dams, the project also helps WDFW meet its goal to recover and maintain wildlife populations that depend on shrub/steppe habitat.

Sagebrush Flats provides habitat for species that are protected by state and federal law, including sage grouse, Columbian sharp-tailed grouse, sage thrashers, sage sparrows, loggerhead shrike, Washington ground squirrels, and white-tailed jackrabbits. Pygmy rabbits once were found on the property but now are believed to be extinct. However, pygmy rabbits are being raised in captivity for release at Sagebrush Flats. WDFW began augmenting



the sharp-tailed grouse population in 2005 with birds raised in captivity, and the agency plans to begin releasing pygmy rabbits in 2008 or 2009.

The habitat-enhancement work includes improving and expanding habitat for bird nesting, brood-rearing, foraging, concealment, and winter survival. This includes controlling weeds,



Restoring former agricultural fields with native shrubs and grasses is an important part of improving wildlife habitat. Here, a field is prepared for seeding.

restoring former agricultural fields with native shrubs and grasses, and planting trees and shrubs along streams that run through the refuge. Other wildlife – mule deer, for example – also benefit from the habitat improvements.

The project dates to 1992, and in that time WDFW has seeded more than 480 acres of former agricultural land with native grasses, controlled knapweed, and another invasive species known as Dalmatian toadflax by releasing insects that kill the plants, constructed 17 miles of firebreaks to protect the sagebrush, and constructed reservoirs at strategic locations to aid firefighters in the event a wildfire breaks out. More than 10,000 trees and shrubs have been planted along West Foster Creek, and 550 others were planted within fenced enclosures to protect them from grazing deer. Some 2,500 feet of fence also was constructed to protect stunted trees and shrubs from foraging deer. [CQ]



Planting willows along the shore of West Foster Creek will provide shade as the trees grow and reduce the water temperature, which is good for fish, and also provide forage and cover for wildlife.

# History Now

The first Columbia River bridge  
in the United States  
was completed in 1908  
at Wenatchee, Washington



Photo: S. Wilson, Author of Bridges

To learn more about  
Columbia River history  
visit the Council's  
Columbia River History Project website  
[www.nwrcouncil.org/history](http://www.nwrcouncil.org/history)

## Northwest Q & A: Sakura Urban Concepts

**W**hile not a new concept, the idea of green design or eco-building has grown as rising fuel prices and concerns about climate change dominate the news. In Portland, as in other parts of the country, a number of design and development firms, both large and small, are beginning to incorporate a variety of environment-friendly features into their buildings. Sakura Urban Concepts is one example of this trend.

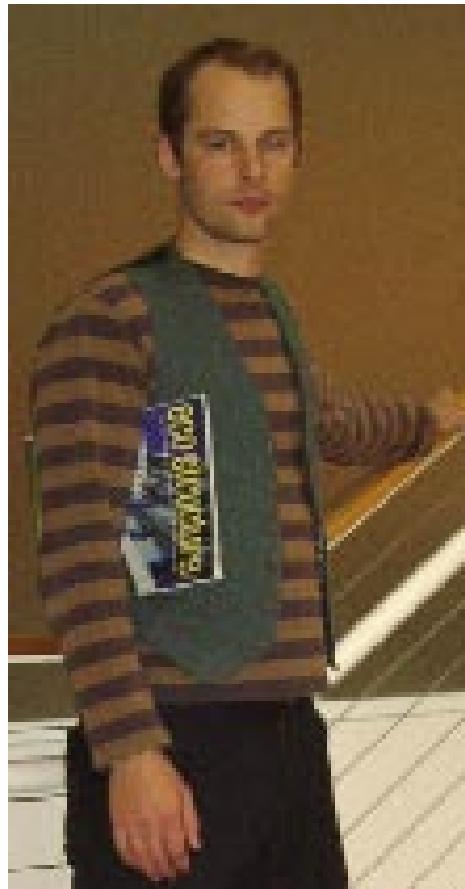
Eli Haworth is a life-long Oregon resident who has been working in the real estate development industry for three years. He graduated from Portland State University in 2005 with a bachelor's degree in community development, and has worked for Sakura Urban Concepts for the past two years. As development coordinator, Eli is involved in every phase of Sakura's development process and strives to incorporate sustainable design practices at every step.

### Tell me about Sakura Urban Concepts.

Sakura Urban Concepts was started in 2005 by Taka Nakagawa and Tim Ready. Taka had been doing residential renovation and decided he wanted to do something that would benefit the public more. He wanted to incorporate his design aesthetic and into new construction and larger renovations like this building—one of our first commercial renovations. [The black/white building, as it's called, was a former warehouse, now home to Sakura, as well as 10,000 sq. ft. of retail and office space.]

This project took about a year and a half. It used to be an industrial warehouse and so we really changed the whole layout. We added the mezzanine layer, and really tried to use sustainable design throughout, including sustainable finishes, low-VOC finishes, bamboo flooring, and compact fluorescent lighting. We see it as a really important piece of conservation right now because they're so much more efficient. We looked real hard at LEDs but I don't think they're there yet in terms of light quality—they're just not very bright.

We believe that renovation is probably going to be a better, sustainable option than new construction because we're saving a lot of material. You know, this is a concrete building so it would have been a real shame to just turn it into rubble and put it in a landfill. So we saved a lot of materials this way, and there's just a character to older buildings that you won't get in a new building. We're really happy with this building.



### Do you know how much energy you're saving?

We haven't really done a lot of good studies on how much energy we're actually saving. For the most part, we're opting for the better choice.

### Is it much more expensive to choose sustainable features?

As far as cost, it depends on how far you want to go. We're doing a project in Irvington called Shizen which is going to be a net-zero building. It will produce all its own energy onsite, for heating hot water and electricity, and it's going to be a highly, highly sustainable building.

But we figure we're probably adding \$200,000 per unit to the price of the condos. Normally, we would sell them for \$700,000 without all the sustainable features, and we're selling them for \$900,000. So that's about a 30 percent increase—but that's really high-end, that's doing everything that we can think of, pretty much.

A very large photovoltaic array will provide about a third to a half of the unit's yearly energy, and then we'll have a biodiesel fuel cogenerator providing hot water and electricity. The generator will provide all the energy in the winter, solar will provide all the energy in the summer. The building will still be connected to the grid, but the idea is that it wouldn't need to be. We're hoping that if we have a summer with a lot of sunshine, we can sell energy back to the grid. That would be a goal.

### It sounds very state-of-the-art. But is there a market for it?

In Portland, there is a market for this kind of design. We're not really sure what it's like in other cities, but we do seem to have a lot of interest in sustainability here. All of our projects so far have had a sustainable component, and people always ask about it, and are drawn to it. And now we've got a nice little list of people who are interested in Shizen, and our realtors have told us that the interest is there.

(continued on next page)

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## What other examples of eco-building have you done?

We've done two other condominium projects. We did the Mado House a few doors down which is a four-unit condominium project. We did solar hot water heating on that project, bamboo flooring, wool carpets, and linoleum, low-VOC finishes, and Energy Star appliances. We just tried to really get all the lower cost sustainable features in there, by that I mean bamboo flooring where you will pay an extra 15 cents to a dollar more per square foot over a more traditional wood floor.

A large photovoltaic array is quite expensive even with incentives, so we're trying to find where it makes most sense to do these things.

## Are other developers incorporating elements of green design?

Gerding Edlen is a large development company that is doing some really great work. They're obviously on a different scale than us; we're more of a boutique developer and they're definitely large scale. You know, I think a lot of developers are thinking about it right now, thinking about sustainability, seeing that there is definitely a desire for it and a market. We're really interested in pushing the envelope.

## Obviously, staying on top of the latest technology is important.

Definitely. Part of what I do is just spend time on the internet, just looking and seeing what other people are doing. Our architecture firm has some quality

folks that are just in love with the idea of building sustainably. So we all spend a lot of time just giving each other a heads up about what's going on technology-wise.

Besides the use materials, is there a design element to building sustainably? I've heard of daylighting design, where you utilize as much as possible, natural daylight, as one example.

It's very important to design a building to take into account the sunlight. It used to be you would just orient the building to the south and use a lot of south-facing windows. Now it's like, well, maybe

The indoor air quality is very good here. We used recycled denim jeans for insulation in the roof to keep fiber glass particulates out of the air. And it was maybe a third more than regular insulation.

## What other projects are you working on?

Upcoming projects include the Wygant Lofts on NE Williams, another mixed-use project of six condominium units with ground floor retail. We're introducing a new system there in which we use solar hot water heat panels that feed into a



that's not the best idea because then you've got heating that you're adding in the summer. So there is a lot of design that goes into it. Just the placement of doors, and designing so you get cross-ventilation so the building doesn't require air conditioning, that sort of thing, is very important.

tank that feeds an on-demand heating system, a radiant floor system, and then domestic hot water. That looks like the most efficient system that we've done so far without doing combined heat and power.

*(continued on page 15)*

# From Landfill Gas to Renewable Energy

## Council Decisions

This fall, the Coffin Butte Resource Project began operation of its newly expanded facility, generating renewable electricity from landfill gas. The plant, which is owned and operated by the Power Resource Cooperative, has been in operation since 1995 and is located just north of Corvallis, Oregon. PNGC Power provides the expertise to operate and maintain the plant.

The gas, a natural by-product of the decaying organic matter in the neighboring landfill owned by Valley Landfills, is collected and used to fuel internal combustion engines that drive generators, producing electricity for about 4,000 households.

A reliable, cost-effective renewable, for the last 10 years the project has produced energy 97 percent of the time (in contrast to wind, which produces energy 30 to 35 percent of the time). It has also been recognized by the U.S. Environmental Protection Agency as one of the most efficient plants in the country.

The capacity expansion adds two 20-cylinder engines. The total generating capacity has increased from 2.5 megawatts to 5.66 megawatts. CQ



Coffin Butte plant with landfill in the background.

### Achievable Savings

August

After reviewing public comments, the Council approved the final version of a paper entitled Achievable Savings: A Retrospective Look at the Council's Conservation Planning Assumptions. The paper is posted on the Council's website, [www.nwcouncil.org](http://www.nwcouncil.org), under "Reports and Papers."

### ISAB

The Council appointed four scientists to the 11-member Independent Scientific Advisory Board. The individuals are Richard Alldredge, a professor of statistics at Washington State University; Chris Wood, who heads the Conservation Biology Section of the Department of Fisheries and Oceans, Canada; Dennis Scarneccia, a professor of fish and wildlife resources at the University of Idaho; and LeRoy Poff, an associate professor of biology at Colorado State University. The ISAB advises the Council, NOAA Fisheries, and Columbia River Basin Indian tribes. Nominees for the ISAB are screened by the National Academy of Sciences.

September

### Innovative Projects

The Council recommended five projects to the Bonneville Administration for funding to test innovative techniques to improve fish and wildlife survival. An article about the innovative projects is elsewhere in this edition of Council Quarterly.

### Fuel and Price Forecasts

The Council approved the final version of its revised fuel price forecasts issue paper. The fuel price forecasts will be used in developing the next Northwest Power Plan, a process scheduled to begin in 2008. The issue paper is posted on the Council's website under "Reports and papers."

*Did you know?*

Photovoltaic cells are made primarily of silicon, the same material used in making computer chips.

# Northwest Q & A: Sakura Urban Concepts

(continued from page 13)

## Is this a growing trend? Where do you think this is headed?

I think it's going to permeate into all development, to a certain extent. Some of this stuff, like the Energy Star Program, has been really good for that because it's simple, it doesn't cost a whole lot more, and people are looking for it now. So I see Energy Star appliances and high-efficiency lighting being the norm. I'm hoping the low-VOC finishes (I know this isn't what the Council is involved with), but it's really important as far as indoor air quality goes, and it really doesn't cost that much more. All paints and stains have what are called volatile organic compounds, so when you go into a house that's been freshly painted, it smells real weird—that's the volatile organic compounds in it. It's really not very good for your health in general. And so, for an extra 10 percent, you can get finishes that either have no VOCs or low levels of VOC, and you'll know it right away once a room has been painted; you won't get that horrible smell. It really helps a lot in terms of the environment of the space that you're in. And they're easy to get; every paint store has them. You just have to be willing to pay that extra amount.

As far as some of the higher-end stuff, I believe that solar technology is about to step down in price in the coming years. There are so many technologies, ways of creating photovoltaic panels that are more assembly-like. They've come up with this stamping technology where they literally have this strip of material and they just stamp the panel onto it. I don't quite

understand how it works, but it's a production technique that is getting better. And then there are also some new materials that people are exploring. So we're really hoping that these new panels come out before we finish Shizen because that would help a lot.

## With cost a factor though, you really have to value green design on its own merits, don't you?

The economics aren't quite there yet for these things to pay off in a reasonable amount of time. Although, one thing that our solar guy has brought to my attention is that it does, technically, add to the appreciation and value of the building. But it's been hard to get appraisers to really put what we consider an accurate value on it. Appraisers and lenders aren't really up to speed on green design; that's been one of the biggest things holding us back.

## What is your vision for the energy future?

What I'd really like to see is the full disaggregation of energy. I'd like to see all buildings producing their own energy like the Shizen building, and I'd like to see waste treatment in buildings. There is a new strain of algae that has been produced that will grow on human waste and it's 50 percent oil, so it could basically be processed into biodiesel pretty easily. If we could have systems that are close-looped, where the waste all gets treated onsite, it's turned into biodiesel, and that biodiesel gets used to supply heat and electricity in the winter, with solar panels on the roof in the summer, then we could not need dams—[laughing] well,

we'll probably always need dams... But, I think my biggest concern right now is coal plants—that's what I want to see go away. I was reading the other day that it's really coal that's going to push the carbon issue over the edge, because if we just stopped using coal and kept using natural gas, we'd actually be okay as far as greenhouse gases go. But if we use up all the coal that's in the ground, it's going to create a nightmare situation that we'll never be able to come back from. So it's really coal that we have to stop using.

## And invest in conservation resources. Do you get discouraged thinking about the challenge?

Conservation does look like the best bet right now. The way I figure it, even if things really do go badly, at least I've done something, at least I tried. I think it's important to just keep in mind that things can change quickly. If we really see the need to change quickly, I think we will; it's just a matter of getting people to see that, you know. I'm not going to let myself get discouraged. I think maybe the best thing I have going for me—and that we have going for us—is optimism; that we can change things. We can provide a way for people to live differently, and we have to do that, you know? CQ

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