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# NORTHWEST ENERGY NEWS

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# CONTENTS



## 3 Looking Toward a New Power Plan

The new plan supplement is a beginning, not an end.



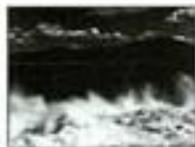
## 8 It May Be a Whole New Energy Game

Utilities are considering new ways of doing business.



## 11 Senator Mark Hatfield Speaks at "Power for the West"

Excerpts from the Oregon Senator's speech at a regional symposium.



## 14 Safeguards for Spring and Summer Migrants

A series of riverwide strategies make salmon journeys safer.



## 18 Regulation's Maddening Maze

How Northwest electric rates discourage conservation.



## 22 A Brief History of Life in Synthetic Streams

An overview of the Northwest's salmon and steelhead hatcheries

## 26 Shorts

## 27 Calendar

### Editor's Notes

About the time you receive this issue, the 1989 Supplement to the 1986 Northwest Power Plan will be rolling off the press. If you have requested a copy, expect it by early June. If you have not yet ordered, but would like a copy, call and ask for publication 89-1. Our numbers are on the back cover. Also coming up is the 1989 Draft Annual Report, which is scheduled to be mailed by July 1, 1989. You can request a copy by asking for publication 89-13. We will be taking public comment on the Annual Report from July 3, 1989 through August 4, 1989.

This issue's cover incorporates a rubbing of a bronze sculpture from the elevator doors of the Public Service Building in Portland, Oregon. The sculpture is one of four on the doors, all of which were designed by Portland architect Pietro Belluschi during his apprenticeship in 1926. Our thanks to Pacific Power and Light Company, which occupies the building.



Oregon Historical Society negative #083566

# Looking Toward a New Power Plan

by Dulcy Mahar

## The new plan supplement is a beginning, not an end.

**T**his past March, the Northwest Power Planning Council adopted a "supplement" to its 1986 Northwest Power Plan. Although the action culminated more than a year of proposals, public comment and revisions — it was hardly a conclusion. It is, in fact, the beginning of a process that is expected to lead to a new Northwest Power Plan in the early 1990s.

The supplement fills an immediate need by providing

a considerably updated forecast of future electricity demand (developed jointly with the Bonneville Power Administration) and data on new resources, so the region will be in a better position to determine which and how much of those resources it needs for the future.

As an official amendment to the 1986 plan, the supplement supersedes the plan in those areas

where the two may not agree. However, the supplement is not intended to be a stand-alone document because it deals only with portions of the plan, most particularly the forecasts and resource discussions. Other areas, such as the schedule for introducing new resources and specific actions to take to acquire them, remain unchanged, because they will require a lengthier regional



Illustration by Dan Mandish

discussion. (For a brief overview of which sections of the plan were addressed in the supplement, see box: Major Components of the Power Plan.)

The supplement marks the initiation of a process to determine the most prudent selection and scheduling of new resources for the Northwest to acquire if it is going to meet its growing electricity needs at the lowest cost. The Council anticipates that this process of information gathering, analysis, evaluation and public involvement could lead to a draft power plan that would be released for public comment during the summer of 1990. The exact timing will depend on the complexity of issues and the extent of public comment on preliminary issue papers.

These first steps toward a new 20-year power plan have particular significance because of the tremendous changes going on within the Northwest and throughout the nation — changes that could have profound effects on the electricity system.

The Northwest electricity system truly does seem to be entering a new era. For nearly a decade, the region has both struggled with and enjoyed an electricity surplus.

Given the Northwest's current economic expansion, that surplus is rapidly decreasing — from 2,600 megawatts in 1986 to an estimated 1,000 megawatts by 1990 — and the region is facing the time when it will have to either build or buy new power resources.<sup>1</sup> This presents a whole new set of challenges. The key challenge is how to acquire new power — which is far more

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<sup>1</sup>Energy conservation is considered a power resource in the Northwest Power Plan. The costs to implement conservation programs and measures are calculated so that conservation can be compared on an equitable basis with power generation resources. Currently, conservation is the most cost-effective of all new resources.

## Major Components of the Power Plan

In addition to introductory chapters that include background on the region and information on how the Council carries out its planning, the Northwest Power Plan encompasses four key sections:

### Forecast of new electricity demand

This section includes economic, demographic and fuel price assumptions used to estimate how much electricity the Northwest will use over the next 20 years. Based on these assumptions, a range of possible growth patterns for the region's electrical demand is developed. Bounded by high and low, the forecast range also includes medium-high, medium and medium-low. *(This section of the plan was updated in the supplement.)*

### Estimates of resource availability and costs

This part of the plan includes all the known information on individual resources — both conservation and generating — and everything that affects these resources, including factors influencing each resource's reliability. Resources have different construction lead times and different life spans. Some also have large up-front costs, then low operating costs, while others have the opposite situation.

To account for these differences, the total costs of a resource (including capital, financing and operating — and inflation if the resource is not to be developed now) are converted into a stream of equal payments — called levelized life-cycle costs — so that all resources can be compared on an equal footing. What it takes to make a resource environmentally acceptable is also included in cost estimates. *(This section of the plan was partially updated in the supplement.)*

### The resource portfolio

Using the data it gathers from the preceding evaluations, the Council runs a variety of computer studies to come up with the comparative costs of individual resources and how each interacts with other resources. From there, the Council develops a configuration of the most desirable resources for four of the paths demand for electricity might take: low, medium-low, medium-high and high growth. These configurations graphically illustrate what is known as the "resource portfolio" — actually a schedule for developing resources.

In each configuration, resources will be stacked in a sequence that shows which resources will be developed, in what amounts and when. The guiding principal will be to come up with the configuration that will meet the Northwest's electricity needs at the lowest cost while managing the uncertainties of the future. *(This section of the plan was partially updated in the supplement.)*

### The Action Plan

The final key element of the power plan is the list of actions and steps that need to be taken in the near future to realize the overall goals and objectives of the plan: a reliable and adequate electricity supply, development of new resources in a manner that is least costly to the Northwest and the flexibility to adapt to changing conditions with the lowest risk. The Action Plan constitutes a work plan for the Council and the Bonneville Power Administration. It also provides guidelines for the region's utility commissions and the utilities. *(This section of the plan was not addressed in the supplement.)* — DM

costly than the existing resources (primarily cheap hydropower)—and keep overall costs to the region and its ratepayers down. Maintaining an economical power supply is critical to the Northwest's economy.

Where the previous focus had been on planning for a somewhat distant future, it is rapidly turning to decisions of what to build now. The Council will be looking at individual electricity resources as well as factors that affect them, such as resource delivery systems, regulations that influence or restrict development of resources, arrangements and agreements that affect the power supply, and environmental impacts. (Staff issue papers have already been released on some of these subjects.)

A number of other events reinforce the concept of a new era for the electricity system, both on a regional and national level. Three of the primary agreements that underlay the Northwest's utility system are up for renewal around the turn of the century, and a number of national trends have been shaping up that could change the way utilities acquire resources. (See box: Changing Currents: The Regional Picture, and related story: It May Be a Whole New Energy Game.)

### Major conclusions

As the supplement process evolved, three major conclusions emerged, and these conclusions are setting the agenda for the development of the new power plan. The conclusions:

- The region's electricity surplus is substantially smaller than when the 1986 Power Plan was adopted. Action will be required in the near term to meet the region's needs.
- The Action Plan generally appears to contain appropriate activities for the next few years. While most of the Action Plan does not need to be changed, the Bonneville Power

## Maintaining an economic power supply is critical to the Northwest's economy.

Administration and the region's utilities need to move more aggressively to implement these activities to ensure a reliable energy future.

- There are a number of major issues that must be resolved to refine the list of resources for the 1990s. Resolution of these issues will be addressed over the next two years.

### A smorgasbord of issues before the region

Taking its cue from the last conclusion above, the Council published a work plan for its power planning division that sets out a proposed agenda for the next several months. The staff will prepare issue papers on key subjects designed to solicit public comment. Advisory committees are being set up to discuss the individual topics. These committees include representatives of utilities, environmental

groups, Bonneville and other government agencies, and the general public. The scheduled work falls into five broad categories:

#### Improve planning techniques

- Work toward developing better computer forecasting models and merging the Council's model with Bonneville's.
- Review the financial and economic assumptions, such as costs for long-term financing and discount rates, used as a basis for determining total resource costs. Resources must be compared on an equal footing to make prudent resource decisions.
- Revise supply functions—the estimates of what amount of a resource is available at what cost. For example, a better way is needed to estimate industrial conservation. It is currently difficult to estimate an average amount of industrial conservation because, unlike the situation with residential and commercial buildings, there are wide differences in how industries use electricity and much of the information on this use is proprietary.
- Seek better information on how much of the conservation resource has been implemented (e.g., percentage of new electrically heated houses built to the Council's conservation standards). Updated information will show up as a reduction



in the demand forecasts.

- Analyze methods of assessing environmental impacts of resources, and look for ways to quantify these impacts in resource costs.

#### State of the region

- Participate with Bonneville in updating the load forecasts and getting the most accurate and current estimate of electricity surplus/deficit conditions. Special attention will be paid to the load/resource balance of individual utilities in order to develop a more accurate snapshot of the region.
- Evaluate individual utility plans to acquire resources to develop a more accurate regional picture and uncover potential differences in data and analyses.
- Review terms and conditions of interregional power sales to determine their impact on the regional surplus (some will have callback provisions) and to account for power sales and purchases in the assessment of the region's existing resources.
- Develop information and review impacts on power plan of actions to renew or alter major agreements that are due to expire within the 20-year planning period. These include the Columbia Storage Power Exchange, the Pacific Northwest Coordination Agreement and Bonneville's power sales contracts. (See box: Changing Currents: The Regional Picture.)
- Assess the status of the region's research and development of resources. An advisory committee has been established to review research and set priorities.

## Changing Currents: The Regional Picture.

**T**hree major agreements, which together underpin the Northwest's hydro-based electricity system, are all due to expire around the turn of the century. It is not premature to begin to explore whether these agreements will continue, and what new terms and conditions might come into play.

First, the agreement between Canada and the United States, which delivers a substantial amount of Canadian-owned power to the Northwest, calls for the return of that power to Canada between 1998 and 2003. This agreement grew out of the Columbia River Treaty, which was signed in 1961, but not ratified until 1964.

As part of the treaty, Canada built three storage dams on its part of the Columbia River, where 30 percent of the streamflow originates, and allowed for construction of Montana's Libby Dam, which backs up water 42 miles into Canada. In return, Canada got half of the added downstream power production. This is called the "Canadian Entitlement." The treaty dams more than doubled the system's storage capacity, improving regulation of streamflows throughout the year and increasing firm power production.

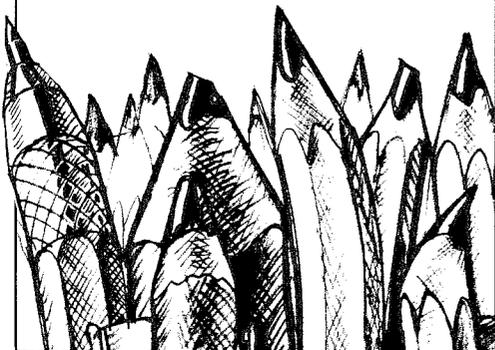
However, Canada didn't have an immediate internal market for its half of the increased power output, so it sold its entitlement under a long-term contract to the Columbia Storage Power Exchange, a non-profit entity formed by several Northwest utilities in response to the treaty. With the expiration of this agreement, the Northwest would return approximately 500 megawatts of energy and 1,300 megawatts of capacity<sup>1</sup> to Canada, starting in the late 1990s.

In a related development, the Pacific Northwest Coordination Agreement of 1964 will end in 2003 unless it is renewed. This agreement governs the operation of most of the Northwest hydropower system, including the seasonal release of stored water by both federal and non-federal hydropower operators in the Columbia River System to obtain the maximum usable energy from the system.

The agreement allows the system to be run efficiently as if it had one owner. It regulates reservoir operation by setting guidelines for maintaining stored water at a level, called the "critical rule curve," below which storage would be insufficient to meet firm (guaranteed) power needs. It also sets the energy content curve, which charts reservoir seasonal levels that determine the amount of storage water available to generate nonfirm (availability depends on snow/rain) energy.

Finally, the Bonneville Power Administration's power sales contracts expire in 2001. These contracts are 20-year agreements between Bonneville and its individual customers (principally utilities and energy-intensive industries). The contracts, which Bonneville was required to offer by the Northwest Power Act, set out the terms for power sales and conditions for power curtailments. — D.M.

<sup>1</sup>Energy refers to the total megawatts produced over a specific time (usually a year). Capacity refers to the maximum power that can be produced at any given moment.



### Influences affecting access to and delivery of resources

- Evaluate bidding schemes to acquire new resources, and look at the experiences other regions have had with bidding processes and their applicability to the Northwest. (See: It May Be a Whole New Energy Game.)
- Assess the impact of the trends toward deregulation within the utility industry including effects on market place competition, transmission and distribution. (See: It May Be a Whole New Energy Game.)
- Analyze regulatory and other existing barriers that discourage utilities from developing their full conservation potential. (See related story: Regulation's Maddening Maze.)
- Evaluate environmental impacts of resources with consideration for new information about non-site-specific impacts, such as global warming.

### Conservation resources

- Review existing conservation programs to determine the most effective program designs.
- Examine strategies to reduce electricity losses during transmission and distribution (up to 10 percent of the electricity is lost).
- Evaluate new techniques to conserve electricity by installing equipment to regulate voltage of distribution feeders so that end uses of electricity would not get more power than needed.
- Identify and secure remaining "lost opportunities." These are actions that must be taken at a certain time so that a resource will not be lost to the region. An example would be putting in energy-efficient systems when irrigation equipment is installed or replaced. Unless it's done at installation, energy-saving measures usually won't get added. Thus the opportunity to get the conservation savings is lost.

## A number of events reinforce the concept that it's a new era for the electricity system.

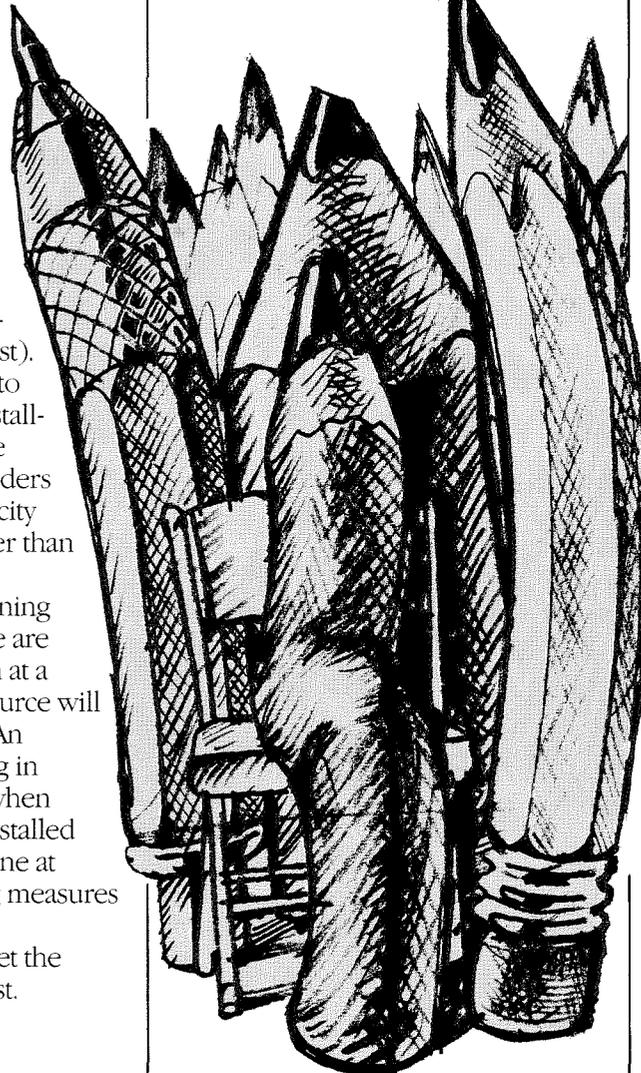
- Re-evaluate discretionary conservation in terms of the declining surplus and determine if any or all of such conservation development should be stepped up. An example of discretionary conservation is weatherization of an existing house. Since it can be done at any time, the failure to weatherize at a particular time does not create a lost opportunity.

### Generating resources

- Further assess the costs and availabilities of specific resources, with special emphasis on areas of significant uncertainty: amounts of fossil fuel available, interactions between various fuels, limits to

development imposed by environmental considerations and cogeneration availability (a resource where accurate estimates are particularly difficult).

- Continue to explore strategies for and issues surrounding changing the uses of the existing hydropower system. Look at back-up mechanisms that could be used to firm up the additional hydropower available in years where the water level is above a standard called "critical water."
- Examine the potential for renewable energy resources, including an assessment of technological improvements and economics for wind, geothermal, solar, tidal, biomass and other renewable resources.
- Review the cost-effectiveness of alternatives for repowering the steam turbine generators at the Hanford N-reactor to produce electricity.
- Review the status of and uncertainties surrounding two uncompleted nuclear projects in Washington state.



Once the data and public input are gathered and evaluated on these subjects, the Council can propose changes and updates in its resource portfolio and Action Plan. When this work is completed, a draft power plan will be put out for public comment, and hearings will be held in each Northwest state. This won't be the only opportunity for public comment. The Council will take public comment on the series of issue papers that will be released addressing the myriad of individual issues to be considered as part of the new plan development process. ■

# It May Be a Whole New

## Utilities are considering

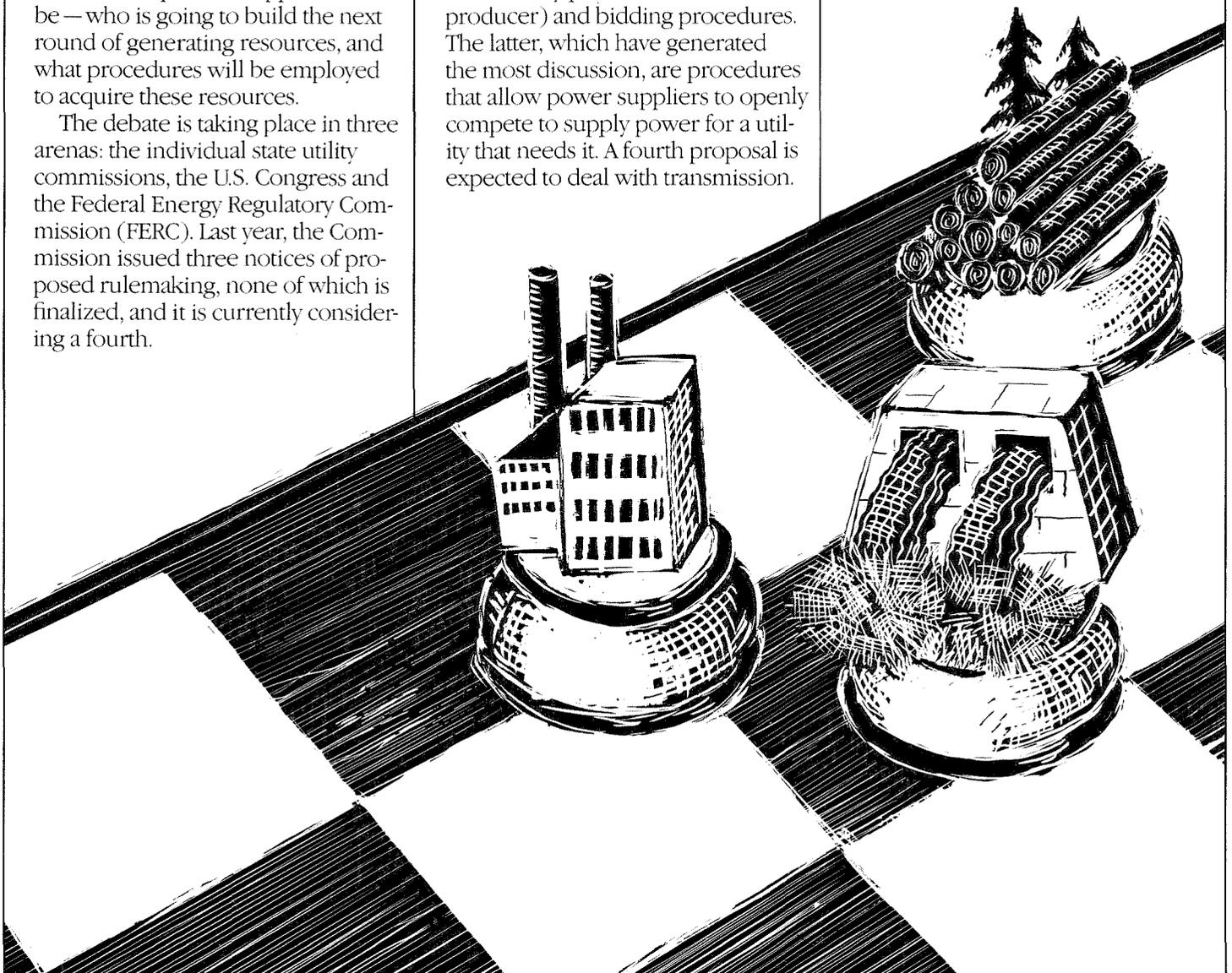
by Dulcy Mahar

**I**t has been a lively year for the nation's utility industry, and proposals are taking shape that could permanently alter a number of traditional ways utilities do business. The central questions appear to be — who is going to build the next round of generating resources, and what procedures will be employed to acquire these resources.

The debate is taking place in three arenas: the individual state utility commissions, the U.S. Congress and the Federal Energy Regulatory Commission (FERC). Last year, the Commission issued three notices of proposed rulemaking, none of which is finalized, and it is currently considering a fourth.

**T**he Commission's proposals deal with deregulating independent power producers; the administrative determination of a utility's avoided costs (what the utility would have to pay for a resource it would build if it didn't buy power from an outside producer) and bidding procedures. The latter, which have generated the most discussion, are procedures that allow power suppliers to openly compete to supply power for a utility that needs it. A fourth proposal is expected to deal with transmission.

The traditional model for acquiring new power resources has been for utilities to build their own generating plants. But economies of scale may have reached their limit, and in today's world "big" may not be "better."



# Energy Game

**new ways of doing business.**

From a utility's standpoint, there are enormous risks associated with investing a huge amount of capital in a large, central-station power plant. Many believe that purchasing power in increments from outside

sources is the answer. They also believe that greater flexibility (read—less regulation) will be necessary to foster a competitive marketplace.

The Commission's proposals are basically designed to open up the resource acquisition process and allow new ways for utilities to acquire energy. The trend had begun with state utility commissions, which, taking note of the marketplace competition, had come up with the idea of utilities advertising when they needed power and taking

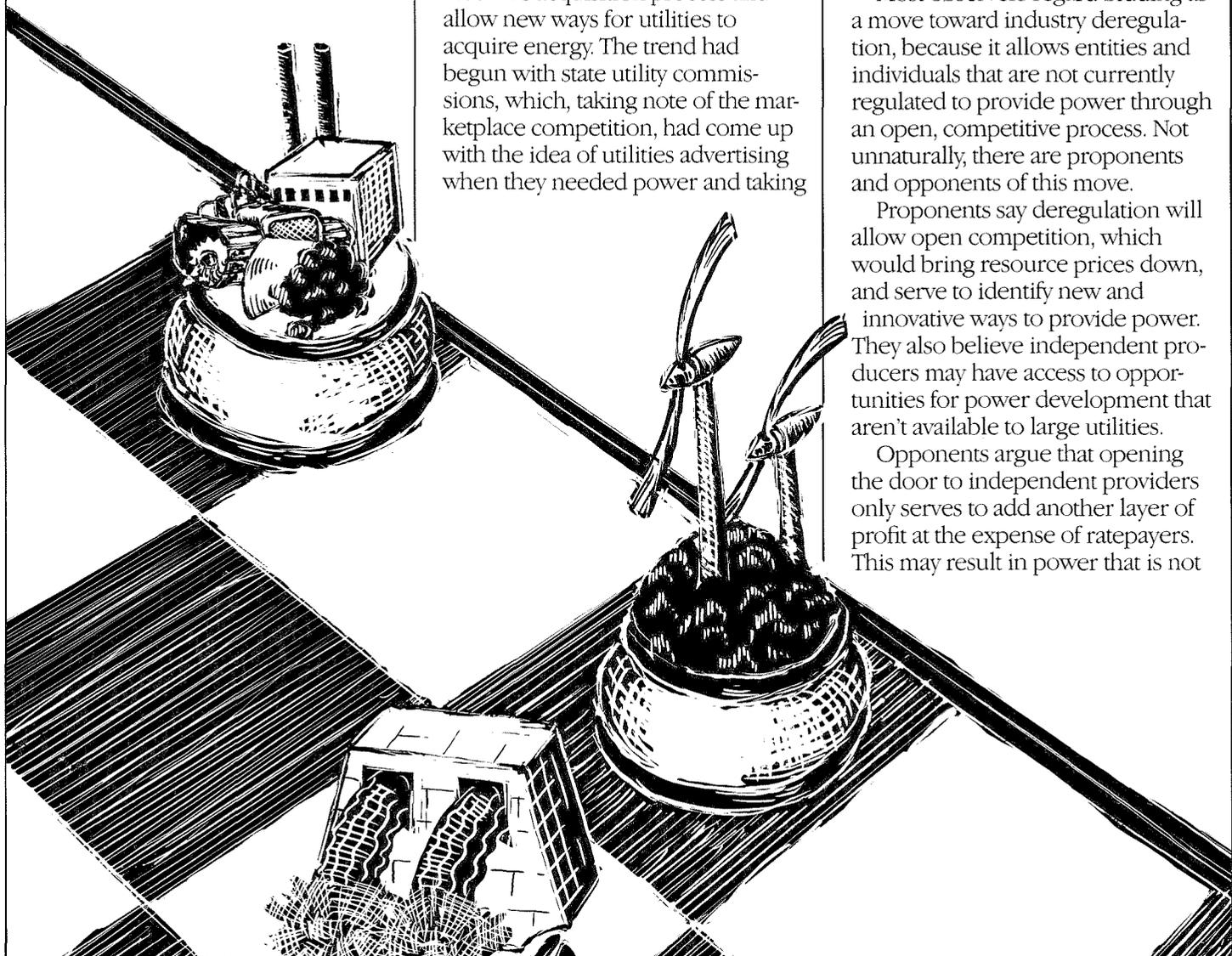
bids to supply that power.

At last count, 14 states had authorized bidding processes for new resources. (In the Northwest, Washington is considering bidding.) The Commission proposed to institutionalize this process.

Most observers regard bidding as a move toward industry deregulation, because it allows entities and individuals that are not currently regulated to provide power through an open, competitive process. Not unnaturally, there are proponents and opponents of this move.

Proponents say deregulation will allow open competition, which would bring resource prices down, and serve to identify new and innovative ways to provide power. They also believe independent producers may have access to opportunities for power development that aren't available to large utilities.

Opponents argue that opening the door to independent providers only serves to add another layer of profit at the expense of ratepayers. This may result in power that is not



only not cheaper to develop, but also carries an additional charge for the middleman. Some fear that utilities, which have an obligation to serve customer loads, could come to rely too much on non-utility providers who carry no such service obligation.

There is also concern that, while bidding can complement utility plans that ensure adequate energy at the lowest cost, it also could be used by utilities as a substitute for doing so-called least-cost plans.

Creation of these non-traditional delivery systems was spurred by the Public Utility Regulatory Policies Act of 1978 (PURPA), which requires utilities to purchase power from qualified producers at the price the utility would have had to pay to construct its own new generating resource (this is known as the "avoided cost"). PURPA, which came on the heels of the oil embargo and growing national concern for energy independence, was designed to promote development of small-scale renewable resources.

There are at least four methods emerging for delivering power resources in addition to self-generation, which involves no outside sale of power; an industry would simply produce its own power supply.

1. First, there is the traditional delivery system in which a utility builds and operates its own power resource.
2. Under PURPA, entities known as "qualifying facilities" — they produce fewer than 80 megawatts of power from renewable or geothermal resources, biomass and waste, as well as cogeneration (which has no megawatt limit) — have the right to sell power at a utility's avoided cost.
3. Independent power producers are non-utilities that build generation, run it and contract to deliver the power to a utility. They are not limited in size, although typically they produce 150 to 250 megawatts. One of the current FERC proposals would deregulate these entities.

4. A fourth arrangement is where one utility forms a subsidiary and builds resources that it sells to other utilities. PURPA regulations require that the selling utility cannot own more than a 50-percent share in the subsidiary that builds the resources.

These new arrangements have specific relevance to the Northwest, and they could affect the Northwest Power Planning Council's planning process in two ways. First, most of the region's investor-owned (private) utilities have indicated they will not be building their own resources. They expect to rely on non-utility resources that are acquired through bidding.

Second, the Bonneville Power Administration, which supplies most of the public utilities' power, is developing a resource acquisition policy, as called for in the Council's plan. Early indications are that the policy will focus on bidding as one of the major ways for Bonneville to get resources.

The emphasis on how resources are acquired appears to be changing rapidly. This past March, the American Bar Association held its second annual conference on "Electricity Law and Regulation." According to Bob Lohn, chief counsel for the Council, there was a marked change in focus from the preceding year.

"Where one year ago the discussion revolved around whether or not these changes should occur, the discussion this year was on how to implement them," Lohn reported. "The possibility of independent power producers is now widely accepted. The debate is no longer on whether it will come about, but on how it will fit into the utility industry."

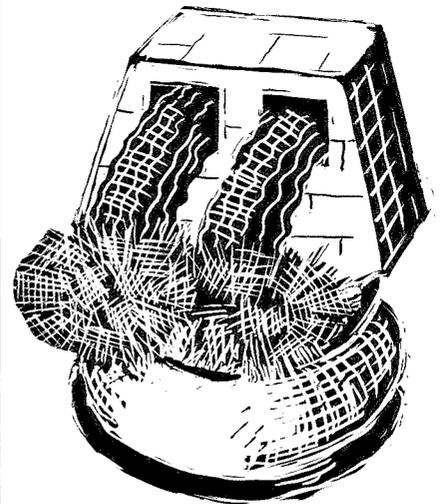
A related issue emerging this year involves transmission, according to Lohn. "If you're going to have power independents, how will they get the power from point A to point B," he said. The Commission is currently working on a notice of proposed rulemaking that is expected to deal with this question.

Still other significant and related changes come in the form of initiatives to alter the Public Utility Holding Company Act of 1935, which limits the ability of utilities to engage in unregulated activities. Currently, there are no independent power producers that operate plants unless they have specific exemptions from the Holding Company Act.

Congress will be reviewing several initiatives to amend the Holding Company Act. The judgments made on these initiatives are expected to address the shape and structure of the entire electricity industry in the United States. The most sweeping change seems to be a shift from relying on utilities building their own power plants toward more dependence on purchased power.

All of these changes are set against the background of a nation whose power needs are growing; indeed, time has run out for some regions such as New England, which is already power deficit.

The Northwest, by comparison, still has a grace period in which to make some decisions, albeit a period that is considerably shorter than that which existed when the 1986 Northwest Power Plan was adopted. If it is to be realistic, the Council's new power plan will have to recognize the sweeping changes taking place on the national, as well as the regional scene. ■



Excerpts from a speech by  
Oregon Senator Mark Hatfield  
(Delivered March 21, 1989 in  
Portland, Oregon.)

## Senator Mark Hatfield Speaks at “Power for the West”

**M**any of us here today have been involved in the issue — “Power for the West” — for over 30 years. I was governor during the signing of the Columbia River Treaty by President Eisenhower and Prime Minister Diefenbaker in January, 1961. Its ratification signaled the beginning of a new era of coopera-

tion and coordination between the United States and Canada, with regard to our water and power resources. Since then, we have been involved in the development and protection of a regional power system, which has been

almost singularly responsible for the development of the Northwest economy.

Our hydro-based power system and the Northwest’s economy have been under challenge for eight years.

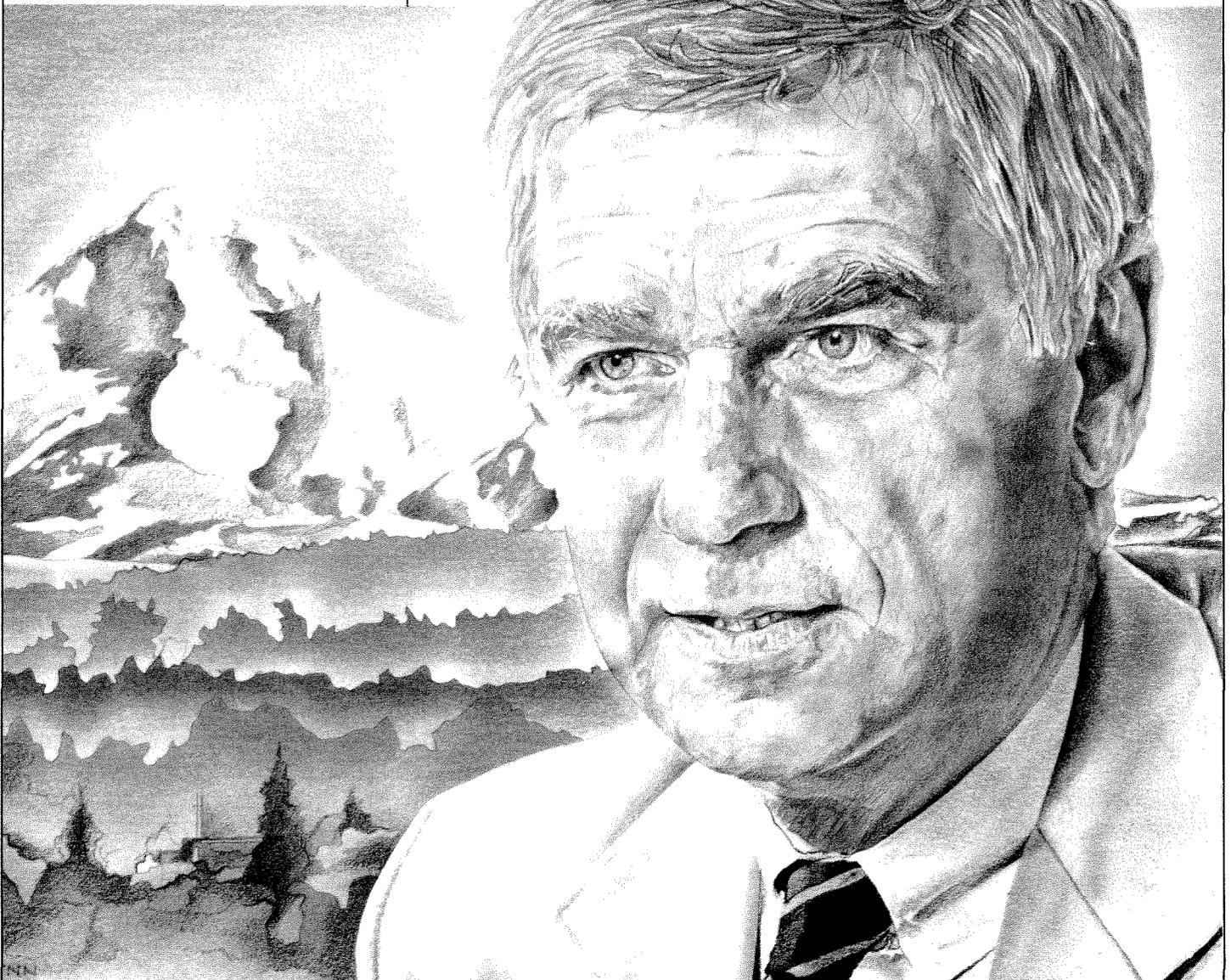


Illustration by Lynn Carson

## The conservation resource is in keeping with our inherent responsibility to be just stewards of the natural resources we have inherited and will one day pass on.

Former President Reagan's first budget attempted to deal with the deficit by proposing to sell off capital assets such as the Bonneville Power System.

The eighth and final Reagan budget, which President Bush inherited, again included an attack on BPA [the Bonneville Power Administration] by proposing to increase the repayment schedule, which would result in about a 35-percent wholesale rate boost and threaten the Northwest's slow recovery from a long recession. The idea is nothing short of disastrous; it's like sending an enhanced radiation warhead into our recovering economy in the Northwest. This bomb is aimed at the wrong target.

BPA has maintained regular payments over the last several years and has been a rich source of revenues to the federal treasury. It would be a case of killing the goose that lays the golden eggs.

The repayment rate decision will be made on a basic political level, and the executive branch knows this. Congress simply will not support this proposal. It just isn't going to happen.

We are blessed with a power system that relies primarily on the production, coordination and conservation of renewable resource-based power. We have minimized our reliance on costly alternatives: uranium, coal, oil and gas.

Despite success implementing our regional power strategy, however, we are now at a crossroads in power planning. Not since the Columbia River Treaty was signed, have we faced so many important

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power planning decisions. Most recent load/resource forecasts indicate that our surplus of electricity is quickly running out. Most forecasts suggest that Bonneville's power surplus will run out before 2003. Given the time it takes to bring new power resources on line, that is practically tomorrow. And given our current consumption patterns and power mix, we are running out of options for supplementing our resources.

In the very near future, we may be faced with the choice between thermal nuclear or coal-generated power to meet future demand. The high cost and potential environmental hazards associated with either of these two power sources are unacceptable. With their incorporation into the power mix, electric rates will increase no matter which path is taken. Can we avoid this choice between the lesser of two evils? Perhaps. By renewing our commitment to conservation, we can buy the time needed to research alternatives.

My strategy for postponing this choice involves a strengthened commitment to a fundamental principle — conservation, the ultimate least-cost option. The conservation resource is in keeping with our inherent responsibility to be just stewards of the natural resources we have inherited and will one day pass on. Unfortunately, we increasingly are turning our backs on that

responsibility, using resources today as if there were no tomorrow.

Our commitment to stewardship and conservation must be a function of our inherent responsibility to future generations rather than a function of today's market forces. We are turning our backs on this responsibility by not using our resources wisely.

We have slipped into a throwaway ethic. The average American produces 1,547 pounds of garbage a year — double the West German and Japanese averages.

This throwaway ethic must be replaced with a conservation ethic. Proper conservation will buy us the time necessary to make a determination about the long-term solution to the power needs of the West.

We must immediately set to the task of buying that time. The strategy I suggest could buy us a decade, perhaps even two.

Tremendous gains already have been achieved from residential conservation. We must hold on to those, while getting commercial and industrial users to do more. A recent New York Times article reported that Japan is now 49.1 percent more energy-efficient than the United States. New alloys and technologies in construction, lighting and manufacturing could help commercial and industrial users save between 1,000 and 2,000 megawatts in the Northwest.

Another potential source of additional power is through greater coordination among power providers. Regulated flow agreements between B.C. Hydro and BPA are excellent examples. In managing our power system, we must also be responsible

for other natural resources and our environment as a whole. Better coordination of the Columbia Basin dam system will produce increased firm power with no additional investment or lead time. It can save 300 average megawatts.

At this point, let me also express my pleasure with the spill agreement recently negotiated by the BPA. Spilling water over dams to save juvenile fish runs has a tremendous cost in foregone energy generation. By [the U.S. Army Corps of Engineers] installing fish screens, Bonneville will capture an additional \$15-20 million in revenue by the mid-1990s.

I might add that, due to current budget constraints, we may in the future need to use BPA's borrowing authority to fund construction of the screens. In my role on the Appropriations Committee, I have been able to help provide funding for these projects, but we should look for a long-term, predictable source of regional funding.

Cooperation between regional power suppliers should not stop with these measures, however. Seasonal-diversity exchange agreements (trading energy between the peak demand seasons of each supplier) could mean enormous energy gains.

In simple terms, we in the Northwest should be trading power when we don't need it, in exchange for power when we do. By increasing cooperation within the West, the region can come out a triple winner — benefiting British Columbia, the Northwest and California. Perhaps as much as 4,000 to 5,000 megawatts can be saved by such agreements.

None of these actions alone will buy us time, nor will a power strategy developed by British Columbia, California or the Northwest acting alone. We must have coordination and a collective commitment. B.C. Hydro must adopt additional conservation, efficiency and least-cost planning strategies within its system.

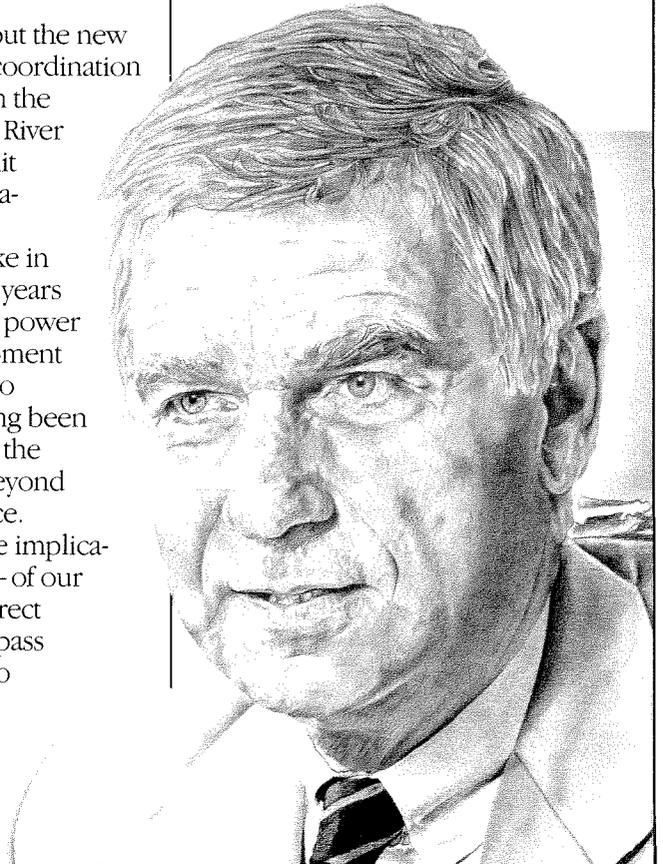
Through direction contained in the Northwest Power Act, Bonneville has been a leader in conservation efforts and in the use of alternative energy sources. But I am concerned that Fiscal Year 1990 underfunds the least-cost path. Bonneville should expand its efforts, particularly in the commercial and industrial sectors. I'm also concerned that the region's investor-owned utilities are short-changing conservation.

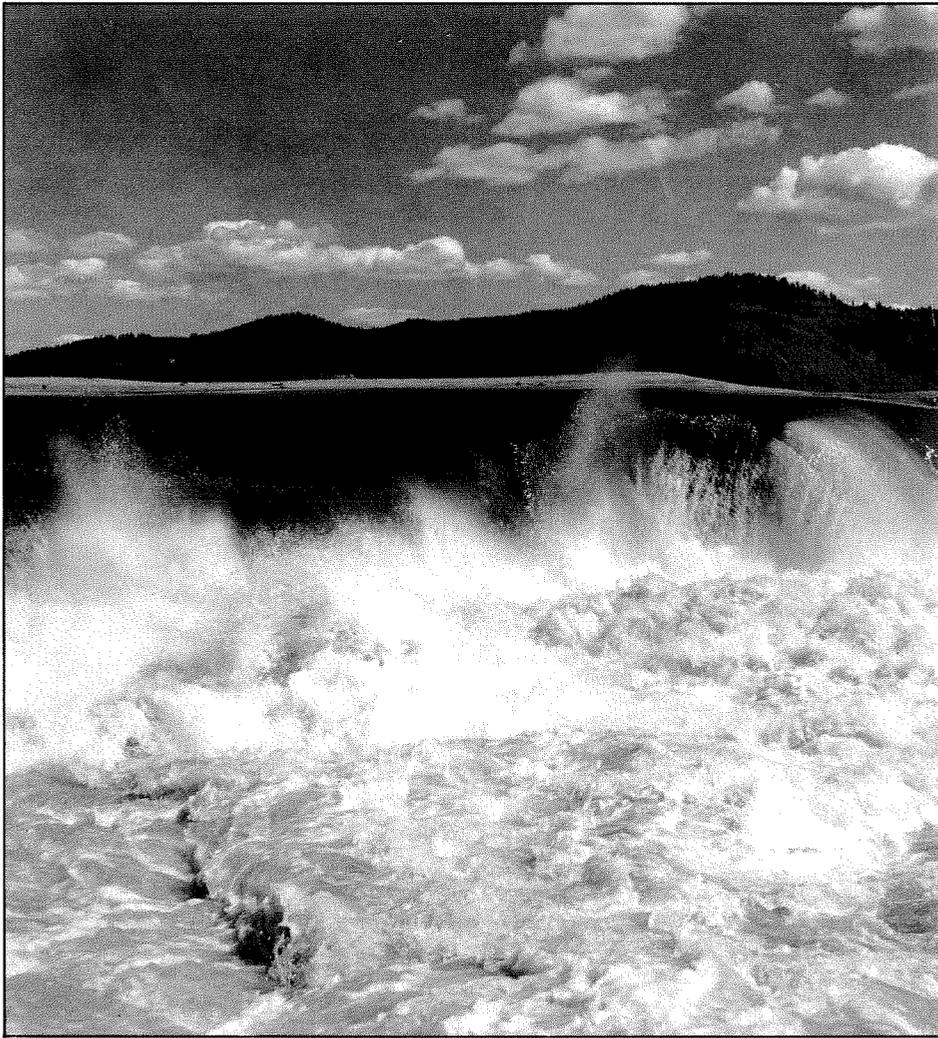
I began by talking about the new era of cooperation and coordination that dawned in 1961 with the signing of the Columbia River Treaty. We must recommit ourselves to that cooperation and coordination.

The decisions we make in the coming months and years will impact our regional power strategy and the development of the West for decades to come. Though I have long been involved in these issues, the impact will extend far beyond my tenure in public office.

But it isn't just me. The implications of your decisions — of our decisions — will have direct bearing on the West we pass on to our children and to their children.

One of America's great statesmen, George Kennan, recently observed: "This civilization we are talking about is not the property of our generation alone. We are not the proprietors of it; we are only the custodians. It is something infinitely greater and more important than we are. It is the whole; we are only a part. It is not our achievement; it is the achievement of others. We did not create it. We inherited it. It was bestowed upon us; and it was bestowed upon us with the implicit obligation to cherish it, to preserve it, to develop it, to pass it on — let us hope improved, but in any case intact — to the others who were supposed to come after us." ■





# Safeguards for Spring and Summer Migrants

A series of riverwide strategies make salmon journeys safer.

by Ruth L. Curtis

**T**his spring, the final signatures are being gathered on an historic agreement to protect salmon and steelhead at dams in the Columbia and Snake rivers. The agreement was negotiated over the past year and a half by representatives of state and federal fish and wildlife agencies, Indian tribes, utilities, dam operators and the Bonneville Power Administration.

Known as the "long-term spill agreement," it is a plan to spill water at four dams each spring to protect young fish migrating to the ocean. These "spills for fish" provide temporary protection for the young migrants until permanent facilities such as screens are installed.

For eons, young salmon and steelhead have left their homes in a myriad of Northwest streams to ride

the currents of the Columbia River system down to the ocean. In the sea, they continue their unique journey, sometimes traveling thousands of miles, feeding as they go. A few years later, when they are mature, those that survive commercial and sport fishers return to the Columbia and fight the currents to return to their home streams to spawn.

As the dams were built across the rivers, this pattern was altered dramatically. The river system was harnessed to prevent the yearly floods from sweeping down the valleys, and to provide electricity and irrigation for growing economies. But the dams turned the river system into an obstacle course. Because of the dams, the annual adult fish runs have declined by at least 5 million under conservative estimates; some believe as many as 11 million fish were lost. (Today's average annual runs are around 2.5 million.)

It has long been known that the dams are barriers for adult fish migrating up the river, and many dams were built with special "ladders" to help the salmon and steelhead negotiate the hurdles. But even more deadly are the impacts dams have on young fish journeying downriver to the ocean. A dam's turbines can kill huge numbers of young fish. The dams have even changed the character of the river system: where once the water flowed freely to the ocean, it is now stored in huge reservoirs. Currents that carried the fish to the ocean have been slowed, and the fish are stalled in reservoirs where they often fall victim to disease or predators.

In recent years, agencies and organizations, guided by the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program, have been working to improve the survival of the fish negotiating the river system — particularly the young migrants. Progress is being made, new agreements are being reached and river operations are changing to take into account the needs of the tiny travelers. Each spring, the obstacles facing the fish are being eased.

## The dams turned the river system into an obstacle course.

### Fish screens and bypass channels

Young salmon and steelhead are often swept into turbine intakes at dams, and some are killed outright, while others are so stunned that, when they emerge, predators easily catch them. On average, 15 percent of the downstream travelers are killed by turbines at each unscreened dam. The cumulative losses are staggering. Of every 100 fish that start their migration from the Snake River or the upper Columbia River, it is estimated that 55 will be killed by the turbines. To prevent this, many dams are built with screens across the intakes and bypass systems to provide an alternative route for the fish to get past the dam.

One of the highest priorities of the fish and wildlife program is to ensure that all federal dams on salmon migratory routes have screens and bypass systems. In particular, the U.S. Army Corps of Engineers was called upon to construct screens at Lower Monumental and Ice Harbor dams on the Snake River, and John Day and The Dalles dams on the Columbia River.

At the John Day Dam, construction of new screens and bypass systems was completed in the spring of 1987. The new systems have worked well for the spring migrating fish, but for some unknown reason, they have not been successful for the summer migrants. So water laden with young fish is spilled at John Day during the summer. The Corps is proceeding with

work at Lower Monumental, and its bypass systems are expected to be operating in time for the 1993 fish passage season. Work at the other two dams is in the design phase.

At Bonneville Dam near Portland, Oregon, a second powerhouse was completed in 1982. Although screens and bypass systems were installed at that powerhouse, the dam has had a dismal record for protecting fish. The Corps is studying the problem and attempting to modify the system so it will function as intended. Until functioning screens are in place, spill is used, and the powerhouse is shutdown when young fish are passing.

Fish passage at Bonneville Dam is extremely important because it is the lowest project on the river system, and a majority of the Columbia River system salmon and steelhead must pass it on their way to the ocean.

### Spill

Until these passage systems are installed, the Council has called for spill at the dams. Spill involves releasing water through a spillway, pulling young salmon and steelhead along with it so that they avoid the turbines as they pass the dams. Spill is costly in terms of lost revenue for the Northwest electricity system, because it uses water that would otherwise be used to generate electricity. Therefore, it is considered only an interim measure until permanent bypass facilities are installed and functioning properly at the dams.

The Council has called on the Corps of Engineers to achieve at least a 90-percent fish survival rate at each dam by using spill over the middle 80 percent of the spring and summer migrations, regardless of any impacts to the power system. Unfortunately, each year there has been a great deal of conflict about the implementation of spill, frequently centered on this survival standard. In fact, the standard was not met by the Corps at Lower Monumental Dam during the summer of 1988.

To help settle these disputes, the Council asked the Mainstem Executive Committee, made up of representatives of state and federal fish and wildlife agencies, Indian tribes, the Bonneville Power Administration, the Pacific Northwest Utilities Conference Committee (representing Bonneville's customer groups), the Corps of Engineers, the Bureau of Reclamation and others to work out a settlement for the spill issue.

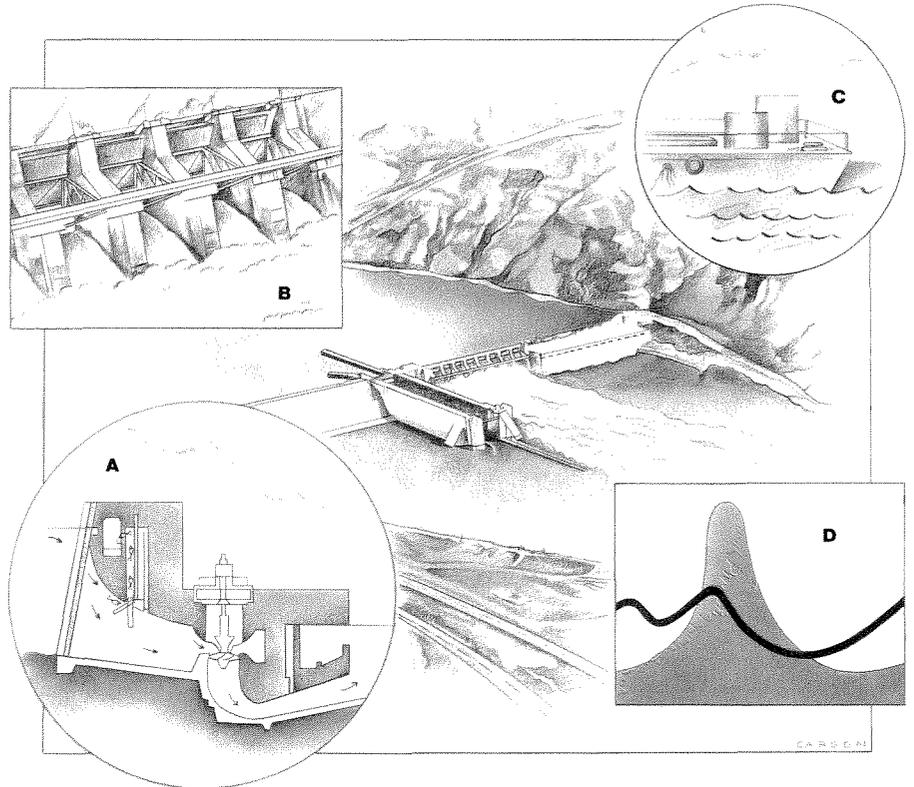
The negotiations produced the new spill agreement mentioned above—a detailed plan for up to 10 years of spill at the Lower Monumental, Ice Harbor, John Day and The Dalles dams—all operated by the Corps of Engineers. (As this issue went to press, the agreement was being distributed among the groups involved for signatures.) But last February, because the spring migration season was rapidly approaching, the Council, approved the agreement's spill standards for the 1989 season only. The entire agreement is scheduled for adoption when all the necessary signatures are collected.

"This agreement makes sense for fish and it makes sense for power," Jack Robertson, deputy administrator at the Bonneville Power Administration told the Council. "It is a negotiated agreement—so no one got everything they wanted, but everyone got enough."

### Mid-Columbia dams

Work is proceeding at the five public utility district dams in the mid-Columbia River in central Washington, to improve their fish passage facilities. The Council called for these improvements in 1982. The utilities agreed to the improvements as part of the conditions imposed by the Federal Energy Regulatory Commission for renewing their dam operating licenses.

Douglas County Public Utility District has installed an improved fish bypass system at Wells Dam, which will be in full operation this spring for the first time. New screens are being studied for Rock Island and Rocky Reach dams, while



### Mainstem Passage Strategy

The Columbia River Basin Fish and Wildlife Program emphasizes four means of improving the survival of juvenile salmon and steelhead attempting to migrate past dams in the Columbia and Snake rivers. A) Permanent bypass systems to divert young fish from the turbines are being installed at each dam. B) Until these are completed, spills of water over the dams will enable juvenile migrants to avoid the turbines. C) Certain stocks of salmon and steelhead are also collected and transported around the dams in barges and trucks. D) Finally, to speed young fish through the system, a block of water is released in the spring when the dams would normally be storing the water to generate electricity later in the year.

at Wanapum and Priest Rapids, other bypass options are being considered, including transporting the fish in barges around the dams or moving them in a long flume (a prototype is being tested this year). While these options are studied, spill is being provided to protect the young fish.

### Transportation

Another way of helping fish avoid the dams is transportation in barges or trucks. With transportation, fish are collected at Lower Granite or Little Goose dams on the Snake River or McNary Dam on the Columbia River and hauled nearly 300 miles to just below Bonneville Dam (a two-day trip). This is an effective means of moving some fish downstream. However, not all fish in the river can be collected, and transportation's effectiveness for spring chinook is questioned because of low survival rates.

The Council agreed with and helped obtain funds for a Corps of Engineers' proposed expansion of fish holding facilities at Lower Granite, Little Goose and McNary dams to facilitate the transportation of fish. Lower Granite's collecting and holding facilities were expanded in 1983. Little Goose's facilities, including a new system for loading fish, will be ready for next spring's migrations, while McNary's will be completed by 1994.

The Corps began operating two new barges this spring, bringing its present fish transportation fleet to six barges.

Last year, the Corps transported over 20 million fish, a record number in the 11-year history of the program. John McKern, the Corps' coordinator of the juvenile fish transportation program, expects the numbers of salmon and steelhead transported to increase dramatically in the next few years because of improved wild spawning success and hatchery production. "The Corps is expanding facilities and

upgrading equipment to collect and transport 40-50 million fish per year, depending on collection efficiencies, and the desires of the fishery agencies and tribes responsible for management of these resources," he reports.

### The water budget

In addition to the physical barriers presented by dams, there are other problems. The reservoirs behind the dams have turned the river system into a series of lakes, altering its natural flow. The spring runoff once quickly flushed the fish to the ocean; now it is stored to generate power in the fall and winter. The fish's journey to the ocean now takes longer — affecting the ability of the juvenile salmon to make the transition from freshwater to saltwater.

This slower current also increases the fish's exposure to predatory fish and birds and, by raising water temperatures and altering water chemistry, increases the fish's susceptibility to disease.

The water budget is the Council's solution to these problems. Often confused with spill, the water budget is very different. It is not water spilled over dams, but a specific amount of water used to wash the fish down to the ocean. While spill helps fish get past dams, the water budget helps them travel between dams.

## Increased coordination with Canada to produce more electricity might affect flows and, hence, fish in the river.

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A predetermined 3.45 million acre-feet of water in the upper Columbia and 1.19 million acre-feet in the Snake River (an acre-foot is 1 acre of water, 1 foot deep or 325,850 gallons) are used during the height of the fish migration (between April 15 and June 15) to artificially increase the rivers' flows, imitating the natural spring runoff. This speeds the young fish to the ocean.

The water budget has only been operating since 1983, and it is difficult to assess its success. According to Rick Applegate, director of the Council's fish and wildlife division, "There are storm clouds appearing on the horizon for the water budget. There has always been discussion of whether the budget should be a block of water or a specified flow level, and with the recent low water years, these concerns are being raised again."

Concern also has risen about the Bonneville Power Administration's recent efforts to coordinate more closely with Canada the use of 3 million acre-feet of water storage at Mica Dam in Canada. This increased coordination to produce more electricity might affect flows and, hence, fish in the river. It is likely that the Mainstem Executive Committee will

be asked to deal with these water budget and Canadian storage concerns.

### Vernita Bar

One program that seems to be a success in the Columbia River system is the assurance of flows at the Vernita Bar to protect the spawning, incubation and emergence of fall chinook salmon. Vernita Bar is located immediately below Priest Rapids Dam, near the Tri-Cities in Washington. It is the last remaining major spawning ground in the Columbia River for fall chinook, known as the upriver brights.

According to Jim Ruff, Council hydrologist, "for several years, Bonneville, on an informal basis, has assisted in ensuring that a minimum level of flows was provided over the bar." Then in 1988, the settlement of a long-standing dispute over Vernita Bar flows required Grant County Public Utility District, in cooperation with Bonneville and other parties, to provide the flows. The result has been that upriver brights have been doing very well in recent years.

The success at Vernita underlines the hope that, while the Columbia will never again be a free-flowing river, it can still become a safer course for the fish migrating out each year. ■



# REGULATION'S MADDENING MAZE

## How Northwest electric rates discourage conservation.

by Gordon Lee

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Regulatory practices in the Northwest and across the United States can discourage utilities from aggressively pursuing conservation measures, a Northwest Power Planning Council staff analysis concludes.

Current regulatory and rate-setting practices favor electricity sales over conservation or energy-efficiency measures. That's because traditional rate structures allow profits for investor-owned utilities based on their revenues. Any steps that reduce electricity sales — such as conservation — cut revenues, and thereby eat into utilities' net profits.

However, many utility regulators are considering new ways of looking at conservation that offer utilities incentives to make energy-saving investments. Regulators across the country are reconsidering assumptions they've used to set electric rates, assumptions that have favored spending on new plants and equipment and on cost-reduction efforts rather than on energy-saving steps. Some of the most innovative regulatory proposals try to uncouple utilities' earnings from the amount of power they sell, give them extra returns and tax credits for conserva-

tion expenditures or reward utilities for reducing customers' bills.

In Washington, for example, regulators this year intend to review the state's electric rate setting practices, which sometimes work against utilities that see revenues drop as a result of conservation measures. "We'll be looking at innovative ways to treat conservation-lost revenues," notes Steve Aos, who is in charge of policy analysis at the Washington State Utilities and Transportation Commission.

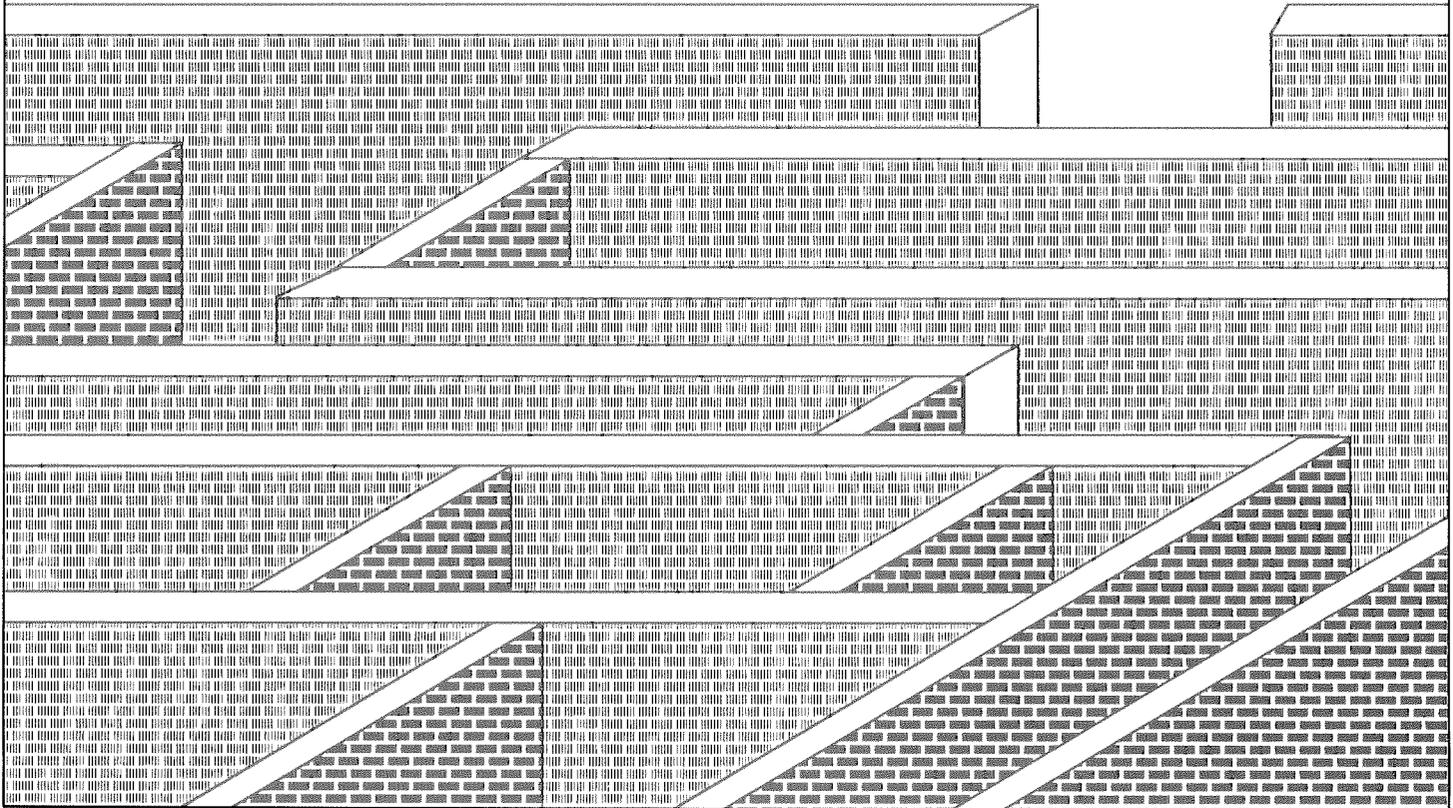


Illustration by Stephen Sasser

Any steps that reduce electricity sales — such as conservation — cut revenues.

Such regulatory changes could play a key role in helping utilities meet the Northwest's energy needs over the next 20 years at the lowest cost. That's because conservation is the region's least-costly source of energy and has been the preferred resource in the Council's recommended energy mix for the Northwest since 1983. It is inexpensive, compared with alternative new power sources. It is environmentally benign. It is relatively easy to implement. And its impact can grow as demand for electricity increases.

Moreover, conservation is an abundant resource. Throughout the region, utilities could conserve 2,600 average megawatts over the next 20 years, under conditions of high energy demand. That's enough energy to replace almost six large coal plants. But electricity obtained through conservation would cost only 2.4 cents a kilowatt-hour, half the price of power generated from a new coal plant. Without conservation, the region would have to spend an extra \$6 billion over the next 30 years to meet demand under high-growth conditions.

However, while conservation's potential is high, current regulatory attitudes restrict its attractiveness to investor-owned utilities, whose rates and resource choices must be approved by state regulators. Utility experts aren't sure how much power these so-called "regulatory barriers" cost the region. But they argue that the Northwest and the nation likely would save thousands of kilowatts if utility commissions judged conservation differently, giving utilities incentives to save energy and shave customers' electric bills. That could postpone the day utilities will have to turn to expen-

## Northwest Rates and Conservation, a Scorecard

Each of the four Northwest state utility commissions treats electrical energy conservation differently. Here's a rundown of their current practices:

### • Idaho

The Idaho Public Utilities Commission in a recent order strongly supported utilities' turning to conservation for new sources of power. The order says the commission will allow utilities higher rates of return on efforts to plug into conservation. That includes so-called lost-opportunity resources — in this case, sources of energy savings utilities obtain by getting builders to construct energy-efficient new homes and offices.

In the past, Idaho has allowed utilities to receive a return on some of their conservation expenditures, allowing them over 20 or 30 years to get back the money they spent plus interest, and to recover in one year other investments dollar for dollar. The new order, however, allows utilities to get a return on all their conservation investments.

### • Montana

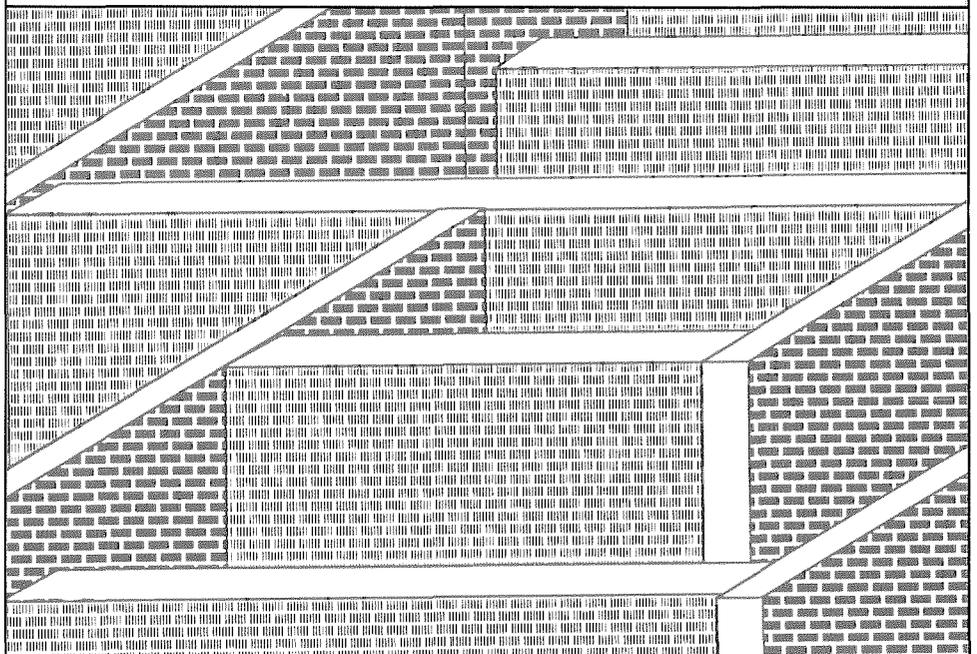
State regulations allow the Public Service Commission to grant 2-percent higher returns on conservation investments than on other utility investments. It also allows utilities to earn a return on their conservation costs through rates over 30 years.

### • Oregon

The Oregon Public Utilities Commission allows utilities to earn a return on approved conservation expenditures. However, some generalized conservation spending, such as administration costs, aren't allowed to earn a return.

### • Washington

The state Utilities and Transportation Commission allows utilities to earn a return on conservation expenditures and permits one company — Puget Sound Power and Light — to adjust rates automatically between rate hearings. It also allows utilities to earn a 2-percent higher return on conservation expenditures than on other resource spending. — G.L.



sive new sources of energy to meet growing electricity loads in Idaho, Montana, Oregon and Washington.

"The problem is the inherent unprofitability of successful conservation programs," notes Ralph Cavanagh, a senior staff attorney at the Natural Resources Defense Council in San Francisco and director of its Northwest Energy Project. "A successful conservation manager is costing utilities income."

Regulation of utility rates has as its foundation the notion of a fair rate of return. That's a level of profit that state utility commissions allow utilities to build into rates, based on their need to maintain service to customers, pay adequate dividends to shareholders and interest to bondholders, and maintain and expand plants and equipment. Part of the rate of return thus covers fixed costs, such as bond payments, and part covers a return on shareholder equity, which is a cost that isn't contractually fixed. Utilities aren't guaranteed they'll earn that return any given year; they're simply given the opportunity to do so.

State regulators traditionally have determined rates for a given period by dividing a utility's allowed or approved costs, often termed revenue requirements, by the amount of power it expects to sell during that time. The result is an amount the utility can charge per kilowatt-hour.

**R**ate setting looks to the future. Rates aren't designed to account for unexpectedly high or low earnings in past years. Rather, rates are supposed to reflect what a utility expects its costs will be over the coming years.

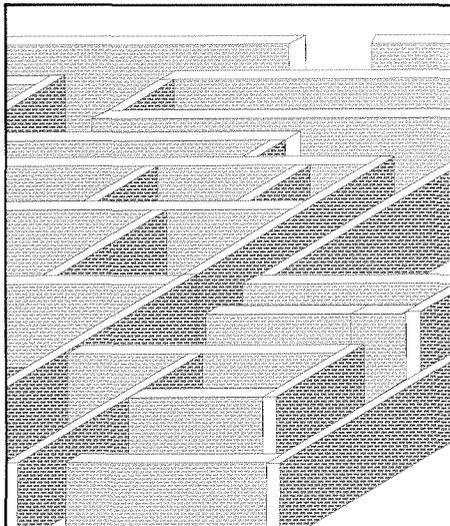
This traditional rate-regulation structure contains several incentives that work against conservation. On the one hand, the structure encourages utilities to build capital assets rather than contract for services. That's because regulators allow only capital investments included in rate bases to receive a return. Regular expenses and contractual payments are recovered dollar for dollar out of rates. As a result, utility stockholders get no return on non-capital expenditures.

## Traditional regulation pushes utilities to trim costs or to sell more kilowatt-hours, not to promote energy efficiency.

At the same time, traditional regulation pushes utilities to trim costs or to sell more kilowatt-hours, not to promote energy efficiency. Once rates are set, utilities can increase short-term returns to shareholders by selling more power than they had predicted or by cutting expenses. In such an environment, efforts to get customers to use less electricity work in the opposite direction, shaving rather than enhancing profits.

"To the extent that the incentive to build operates, it reinforces the incentive to sell by justifying building," notes Wally Gibson, manager of system analysis and rates at the Council.

Those incentives are most apparent during periods of energy surplus, such as the one that has dominated the Northwest for the past decade. With more power to sell than customers demand, utilities can encourage new energy use with-



out incurring substantially higher costs. "The problem is that profits come from selling, not conserving," notes Cavanagh. "At the margin, sales are very profitable. The extra kilowatt-hours utilities sell are very profitable. [With conservation] utilities may be able to recover costs, but what they can't get back are the marginal profits."

But with the prospect that the Northwest's electricity surplus could disappear as early as the mid-1990s, utility experts say the time is right to consider regulatory practices that offer incentives for conservation. In California, for example, the Public Utilities Commission has put into practice regulations that attempt to separate utility revenues from kilowatt-hour sales. Known as an Electric Revenue Adjustment Mechanism (ERAM), this aspect of the state's rate structure looks at a utility's actual and forecast revenues and adjusts rates in succeeding periods based on under- or over-collections. This insulates utility earnings from drops due to conservation or unexpected weather.

"This decouples profits from sales of kilowatt-hours," says Cavanagh, one of the new mechanism's architects. "I'm not talking about guaranteeing profits to utilities."

California's revenue adjustment allows utilities that see revenues fall after they inaugurate conservation programs to recoup those losses by raising their electric rates in later periods.

**H**owever, not every utility will take advantage of that flexibility. Pacific Power and Light Company, for example, which has service territories in northern California, has had a mixed experience with the new mechanism. The company recently has been given the authority under the revenue adjustment mechanism to raise its rates, but it's not likely to exercise that option under current market conditions. "We're pledged to rate stability," says John Shue, director of energy efficiency at the Portland-based utility that serves 670,000 customers in Oregon, Washington, Idaho, Montana, Wyom-

ing and California. "In a competitive market, we can't raise rates."

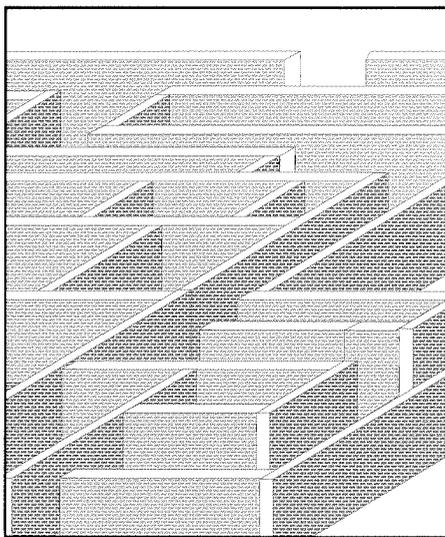
For utilities such as Pacific, which predicts that the utility industry will become increasingly competitive and volatile and that large customers may find new sources of power if prices climb too high, this kind of revenue adjusting isn't an incentive to enter into conservation.

At the same time, some critics fear that the existence of the California mechanism may make utilities less vigilant about controlling costs and keeping a lid on rates, since the adjustment clause guarantees that costs will be recovered. As a result of these and other worries, the California commission's Division of Ratepayer Advocates wants to scrap the revenue adjustment mechanism, and the commission is looking into the issue as part of a larger investigation into revising its approach to utilities' returns, risks and rates.

Other states, notably Washington, allow utilities to earn higher returns on investments they've made in conservation measures than on other investments. In Washington, that bonus amounts to a 2-percent higher return on conservation investments.

However, critics worry that unless this bonus applies to non-capital expenditures, utilities will have little incentive to spend money on education programs or on marketing conservation. Regulators typically allow utilities only to recover the direct costs of non-capital expenditures, Gibson notes. Capital expenditures, on the other hand, can be depreciated over their lives and earn a return.

Moreover, Washington's approach could lead utilities to invest in inefficient or expensive conservation measures. "This is because the amount of the extra return earned is a function of the amount of invested capital, while the lost revenue is minimized by choosing a program that saves little energy," Gibson says. "The issue of gold-plating utility investments is one that is potentially raised by all utility investment and has long been a subject of



academic discussions. It is only slightly magnified by the extra return offered by conservation investments."

Some observers of utility regulation say that the California and Washington approaches are band-aids, and don't address the fundamental problem of incentives. As long as rates and returns still are based in some fashion on kilowatt sales, utilities will have a tough time urging customers to use less electricity.

But David Moskowitz, a commissioner on the Maine Public Utilities Commission, proposes a way out of that circle. He suggests that utilities that have been most successful in lowering customers' bills be given the highest rates of return on all their assets. That focus on bills rather than rates acts as an incentive to conservation, he argues. Utilities would be rewarded equally for conservation or generation resources, assuming they have the same cost.

**The time is right to consider regulatory practices that offer incentives for conservation.**

Unlike California's approach, which acts to preserve a utility's earnings as it pursues conservation, "Moskovitz's proposal would actually increase the utility's earnings to the extent the utility followed least-cost principles," Gibson says. "This would mean that the utility stockholders and ratepayers would share in the benefits of any cost reductions due to conservation being lower cost, rather than the ratepayers keeping them all."

Moskovitz's proposal is new, and the Maine commission hasn't decided whether to test it.

However, at least one Northwest utility says the proposal is better suited for the structured and segmented market on the East Coast than for the highly competitive, potentially deregulated electricity market in the West. "Lots of things make sense for utilities that don't face deregulation and don't face lots of competition," says Pacific Power's Shue. "The proposal says you can benefit from talking people out of using electricity."

Since conservation is a key resource in its Northwest Power Plan, the Council will explore these and other proposals over the next few months. The Council recognizes that state regulatory practices play a large role in the implementation of that plan. Only when it can identify the extent to which regulatory barriers discourage investor-owned utilities from actively pursuing conservation will the Council be able to recommend the most appropriate ways to overcome those obstacles. ■

# A BRIEF HISTORY OF LIFE IN SYNTHETIC STREAMS



## An Overview of the Northwest's Salmon and Steelhead Hatcheries

by Carlotta Collette

**S**pringtime in the Columbia River Basin sees the first of nearly 200 million tiny salmon and steelhead pouring out of concrete troughs, called raceways, to enter streams and rivers enroute to the sea. The fish are only inches long at this stage. They have been artificially spawned, hatched and reared in the

constructed environment of hatcheries. And fewer than 1 percent of them will survive their outmigration and life in the ocean. Their chance of survival is influenced by how far up the Columbia they are when they are released.

Nonetheless, even at 1 percent — or about two million fish — they

amount to about 70 percent of the adult salmon and steelhead from the Columbia River Basin. Only about 30 percent of this basin's sea-run fish naturally reproduce in graveled streams.

Many fishery experts in the Northwest are aware of and at home with this "balance." For them, hatcheries are considered the most efficient means of providing the raw material of an important industry. The first Columbia Basin hatcheries were actually begun by operators of salmon canneries worried that their resource was dwindling.

But others argue that so enormous a dependence on unnatural systems is dangerous. They contend that hatcheries are overrated, that they jeopardize the genetic diversity considered necessary to the long-term sustainability of fish runs, and foster diseases that could threaten all salmon and steelhead.

Still, even those who loudly defend wild runs of salmon and steelhead recognize that some balance of natural and hatchery production is needed. The difficult question is, where should the balance be struck.

Recent legislation in California calls for a program to help double that state's current natural production of anadromous fish (primarily salmon and steelhead). "Reliance upon hatchery production of salmon and steelhead trout in California is at or near the maximum percentage that it should occupy in the mix of natural and artificial hatchery production in the state," reads the legislation. California produces only about half its salmon and steelhead in hatcheries.

**I**f the Northwest is to increase its salmon and steelhead populations to approximately double the current combined natural and artificial production level — the hope of the

Northwest Power Planning Council and one goal of the Columbia River Basin Fish and Wildlife Program — it will likely require new hatcheries. Even if every available basin stream is brought close to full natural production potential, hatchery releases could still be needed. Plans are already under way for four new salmon and steelhead production facilities in the basin. More hatchery proposals are expected from the current endeavor to quantify production potentials and methods in 31 subbasins of the Columbia.

Before any of these is approved for construction, the Council requires that a master plan be drawn up. These plans must describe proposed management policies and practices and detail production profiles that ensure maintenance of genetic integrity in native fish. They must also provide descriptions of release sites and harvest schemes for stock produced in hatcheries but released into streams away from the production facility. Finally, the plans need to include strategies for ongoing biological monitoring and evaluations to track the effectiveness of the project.

### **Science aids production**

The intent of such elaborate planning is to encourage a more considered approach to hatchery operations basinwide. There is no question that the management of fish production has improved greatly in the 110 years that salmon and steelhead hatcheries have been functioning in the basin. Early Northwest hatcheries were all but abandoned in the 1930s, because returns were so negligible. Canada terminated all hatchery production of salmon and steelhead in 1936, after concluding that the synthetic environment didn't produce sufficient returns to warrant the investment. (Hatchery production has since been reintroduced in that nation.)

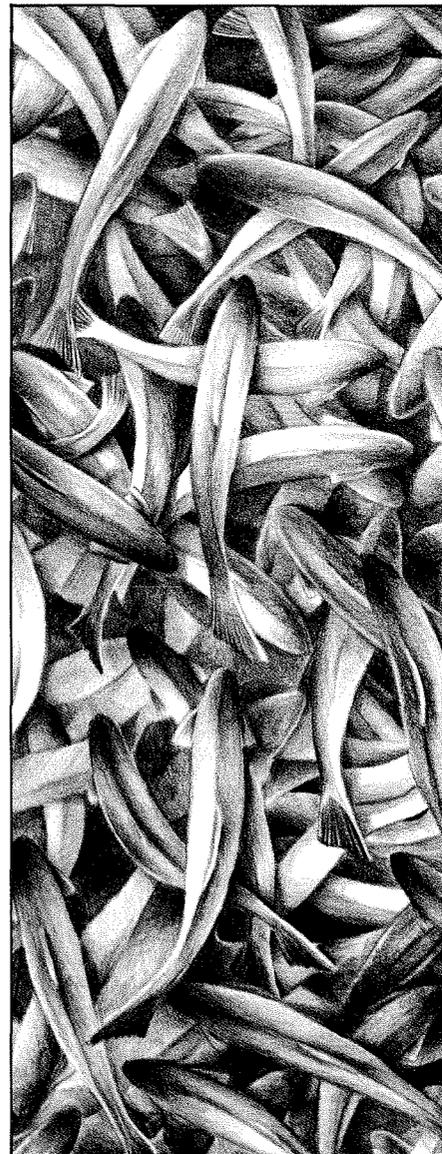
## **Only about 30 percent of this basin's sea-run fish naturally reproduce in graveled streams.**

A big part of the problem was a lack of understanding of salmon biology. Around the turn of the century, hatcheries were turning fish out to fend for themselves soon after they were hatched. Experts figure that few of the 60 or more million fingerlings set into streams in those days survived this abrupt transition.

After some trial and error, it was learned that survival rates could be dramatically improved by feeding the tiny fish for some time before releasing them. Unfortunately, little was known about their nutritional needs. They were primarily fed ground fish and animal carcasses, which, it was much later discovered, tended to spread diseases. Furthermore, it was not until the 1960s that the necessity of vitamins, minerals and antioxidants (a form of preservative) to fish health was understood.

With the invention of pelleted feeds and vitamin fortifications, fish producers were able to serve protein, mineral, vitamin, fat and fiber combinations that specifically nurture young salmonids. As a result, hatchery efficiencies have improved markedly.

Fish propagators have also learned much about the role of water quality and rearing densities in fish health. And research into new fish marking techniques enabled scientists to track juveniles



through the river system and make distinctions among returning adults. Such tracking has helped hatchery managers more precisely time fish releases to optimize smolt-to-adult survival.

### **The limits of science?**

But after a few decades of significant increases in survival rates of hatchery-released salmon and steelhead, the numbers from some facilities appear to be declining. The cause of this downturn is unknown. Some scientists point to continuing disease problems in basin hatch-



eries, which may have led to a concentration of fish pathogens in some populations. Others postulate that poor ocean conditions or the possibility that the estuary and ocean have reached their practical limits for nurturing salmon and steelhead (known as the "carrying capacity") are contributing to the reduced returns.

Still other fisheries biologists question whether the inherent resilience of wild salmon stocks has been "diluted" by inbreeding and the practice of seeding natural streams with hatchery fish without account-

ing for possible genetic risks. Certainty on these genetics issues is difficult to achieve, but enough is known to raise the level of concern.

In salmon and steelhead, genes are the "pieces" of biological information that enable the fish to adapt to particular conditions, such as water temperatures and quality, length of migratory routes and infections. Genetic diversity is the combination of traits inherited by a given population, as in a specific river reach. The more diversity, the more likely it is that at least some fish will survive adverse circumstances. Stocks with little genetic diversity may lack particular survival characteristics and be unable to adapt to changing environments.

Within the Columbia River Basin, there are numerous genetically distinct stocks. Many scientists reason that the future of the basin's salmon and steelhead may depend on traits that could be lost if some of these stocks are pushed to extinction, or if their survival characteristics are weakened through crosses with hatchery-raised fish that do not match them genetically. This concern has led the Council to include in its program an emphasis on assessing the genetic risks of production efforts before actions are taken. This is especially true for those cases where hatchery-produced fish will be set out in natural streams to help rebuild runs in those areas.

### **Stemming deterioration**

Another possible culprit in the declining survival of hatchery fish might be the age and condition of many of the basin's hatcheries. Some of them date back to the turn of the century. These were expanded and modernized when nearly all of the remaining hatcheries and related facilities (a total of nearly 100 exist in the basin) were constructed as compensation for the fish losses caused by hydropower development. But the vast majority of the Northwest's hatcheries have suffered from limited budgets that stymie fishery managers' efforts to maintain and improve decades-old structures and systems.

## **Early Northwest hatcheries were all but abandoned in the 1930s, because returns were so negligible.**

The boom period for this construction occurred in the 1940s and '50s, triggered by Congress' passing the Mitchell Act of 1938. The Mitchell Act came three years after Congress approved the River and Harbors Act, which officially kicked off federal dam building on the Columbia (construction had actually begun two years earlier on Bonneville and Grand Coulee dams). Congress was already certain that the dams would seriously threaten fish runs on the Columbia, and the Mitchell Act was intended as a balm to compensate for some of the anticipated losses.

These hatcheries — a total of 25 were authorized under the Act — are currently funded through the National Marine Fisheries Service and operated by the states of Oregon and Washington, and the U.S. Fish and Wildlife Service. Over the past few years, they've accumulated an estimated \$13 million in deferred renovations necessary to improve operating efficiencies. Recent federal budgets drop funding for these hatcheries and call on the region through the Bonneville Power Administration to pick up their operating costs (about \$10 million each year).

Faced with the uncertainty of continued federal support, Oregon's Senator Mark Hatfield has asked the region to develop options for local support for the hatcheries. Although it will be difficult to take over the funding, hatchery managers agree that a long-term, stable and predictable financial base for these important facilities is needed.

In addition to the National Marine Fisheries Service, other federal agencies, including the U.S. Army Corps of Engineers, the Bonneville Power

Administration and the U.S. Fish and Wildlife Service also fund hatcheries that are intended as compensation for dam-caused destruction of salmon runs. The Northwest states, several Indian tribes and the U.S. Fish and Wildlife Service operate the hatcheries. Most of these face problems similar to those at Mitchell Act hatcheries; they have deferred maintenance and repairs because of budget shortfalls. Now these hatcheries' effectiveness may be diminished as a result.

### Increasing cooperation

Yet another element may be contributing to the slip in success rates for Northwest hatcheries; a lack of coordination among hatchery managers and among their policies. Consistency in management plans could encourage the transfer of viable procedures from one hatchery to another. Accomplishments could be replicated around the region.

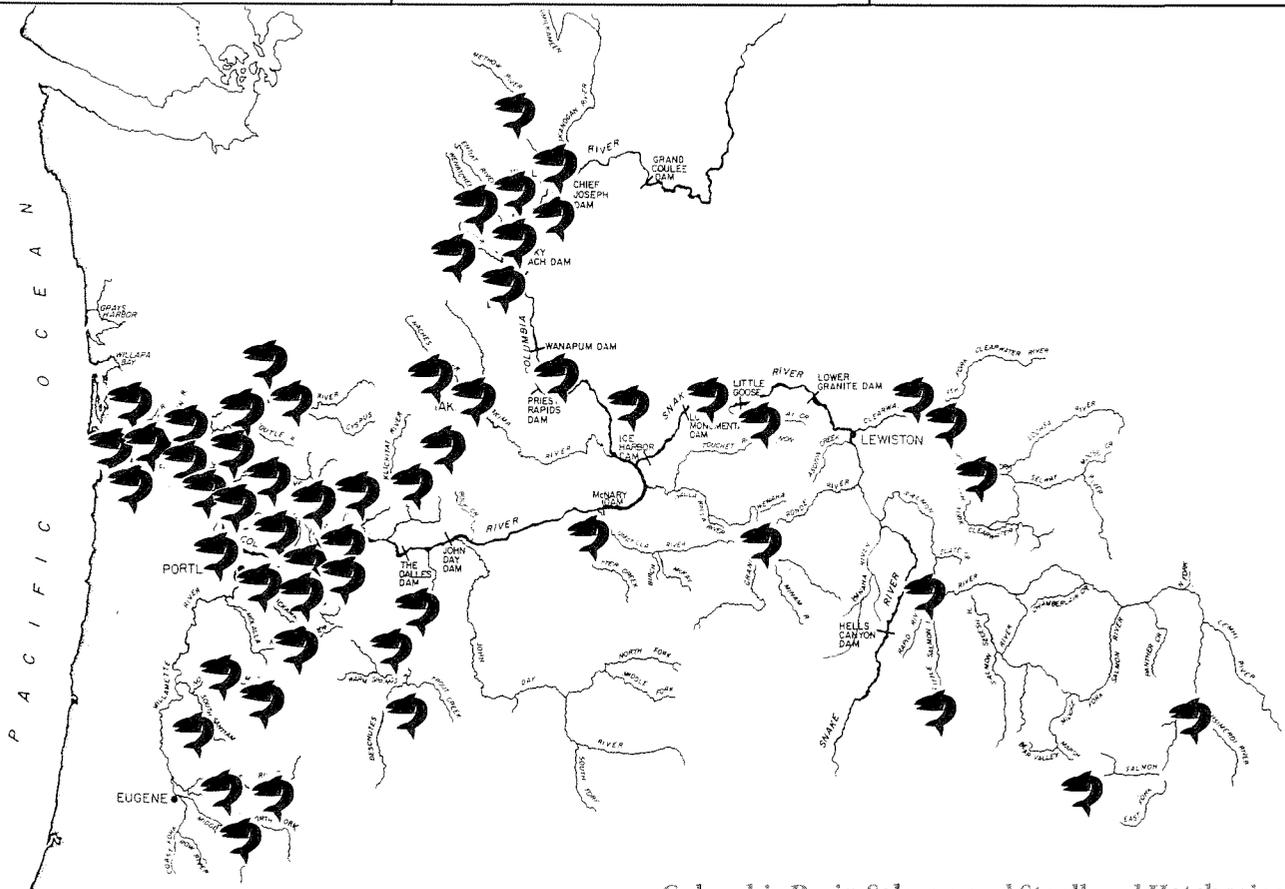
Regional hatchery operators have begun this process through weekly and sometimes daily communication. Many of them serve on committees and technical work groups

aimed at improving hatchery effectiveness. Through the fish and wildlife program's fish disease technical work group, for example, fish disease research has been coordinated and focused on agreed upon priorities. Outbreaks, such as this spring's discovery of "VHS" disease — a virus fatal to 80 percent to 90 percent of the trout in European infestations, but never before detected in this country — show that much remains to be learned. Cooperation in addressing this and other diseases will certainly improve the odds that solutions will be found.

It is clear that the Northwest has entered a new era in salmon and steelhead production. The barriers to cooperative problem solving are disappearing. Most fisheries managers agree that there has never been such unanimity of purpose among those who share a concern for the fate of the resource. Out of this collaboration there will likely emerge new techniques, new approaches and new facilities that rectify the shortcomings of the past and amplify the successes. ■



*For more information, see: "Review of the History, Development and Management of Anadromous Fish Production Facilities in the Columbia River Basin," December 1988 (Draft), Columbia Basin Fish and Wildlife Authority, Metro Center, Suite 170, 2000 S.W. First, Portland, Oregon 97201.*



Columbia Basin Salmon and Steelhead Hatcheries

# SHORTS

The big drought that visited the United States in 1988 appears to be paying a visit to Europe and South America this year. Between December 1, 1988 and the end of February, precipitation in southern Europe was only 25 percent of normal. Throughout the Mediterranean, weather experts say, rainfall averaged 50 percent to 90 percent below normal.

Dry weather also affected Argentina, Uruguay and Paraguay during the same period. That led to lower-than-expected agricultural yields and prompted the city of Buenos Aires to shut off electricity for up to three hours a day in different neighborhoods in December and January. River levels were too low to operate at full power the hydroelectric dams that supply Argentina's capital. (Source: *The Billings [Montana] Gazette*, 2/23/89.)

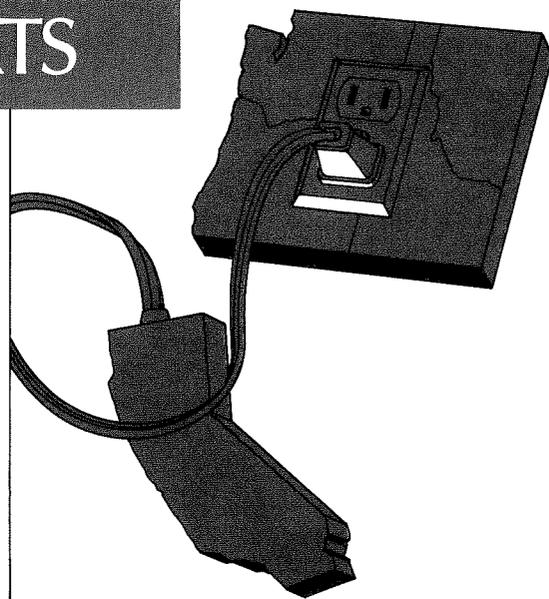
The United States and the Soviet Union this winter agreed to jointly combat poaching of North Pacific salmon they estimate has siphoned millions of dollars from each country's fishing industry.

U.S. and Soviet officials charge that hundreds of boats from Pacific Rim nations, many posing as squid-fishing vessels, string gill nets as long as 35 miles to intercept millions of immature salmon in their migration routes. They unload those fish to at-sea freezer boats, which sell the catch for large profits in Thailand, Singapore and other Far Eastern markets.

U.S. and Soviet officials agreed to share fisheries information and other data in a coordinated effort to prevent the illicit netting. (Source: *The Seattle [Washington] Times*, 2/15/89.)

For the first time in a decade, the United States imported more oil than it produced in January. The United States produced 7.9 million barrels of oil a day during the month, according to the American Petroleum Institute. During the same period, imports rose to 8.2 million barrels a day, a 21-percent jump from the same month in 1988.

This means that the United States imported 45 percent of all the petroleum products, including natural gas, it used in January. Its peak reliance on imports, in February 1977, was 48 percent. (Source: *Energy Conservation Digest*, 2/20/89.)



The Bonneville Power Administration in February sent a record amount of power on its direct-current intertie line between the Northwest and California. The federal power agency sent 3,100 megawatts on the high-power transmission line that links The Dalles, Oregon, with Los Angeles. That's enough electricity to supply three cities the size of Seattle. The record transmission, which utility sources say is the largest ever in North America, came as Bonneville tested recent improvements it and the Los Angeles Department of Water and Power have made to the line. (Source: *Associated Press*, 2/18/89.)

Scientists at the University of Utah announced they made an unprecedented nuclear fusion reaction using tests simple enough to be performed in a small chemistry laboratory.

The achievement, if verified, would represent a giant leap in the generation of nuclear power. It would be the first time that a controlled, sustained hydrogen fusion reaction has been achieved at room temperature. The experiment also was inexpensive, costing about \$100,000. Physicists since the 1950s have tried to harness the energy from machines and lasers costing millions of dollars to produce controlled fusion.

B. Stanley Pons, a Utah chemistry professor and Martin Fleischmann, professor of electrochemistry at the University of Southampton in England, reported in March that they triggered a fusion reaction in a test tube that continued for more than 100 hours using a "heavy" form of hydrogen — deuterium — as the main fuel. Deuterium can be extracted easily from sea water, where it exists naturally.

Other scientists are trying to replicate their results. (Source: *The Wall Street Journal*, 3/24/89.)

*Compiled by Gordon Lee*

# CALENDAR

**May 9-12** — National Symposium on Practical Approaches to Riparian Resource Management, at the Holiday Inn, Billings, Montana. Sponsored by the Montana Chapter of the American Fisheries Society, the U.S. Bureau of Land Management, the Western Division of the American Fisheries Society, the U.S. Forest Service, the Society for Range Management, the Montana Riparian Association and the U.S. Fish and Wildlife Service. For more information: Glenn Phillips, Montana Department of Fish, Wildlife and Parks, Capitol Station, Helena, Montana 59620, or call Marilyn Goetzinger at 406-444-2406.

**May 9-10** — Northwest Power Planning Council meeting at the Elkhorn Hotel in Ketchum, Idaho. (Note: This is a Tuesday/Wednesday meeting, not the Council's usual Wednesday/Thursday meeting.)

**June 13-14** — Northwest Power Planning Council meeting at the Edgewater Hotel in Seattle, Washington.

(Note: This is a Tuesday/Wednesday meeting, not the Council's usual Wednesday/Thursday meeting.)

**July 5** — Symposium on Indian Fisheries at the Sheraton Towers in Seattle, Washington. Sponsored by the American Fisheries Society-Western Division and the Native American Fisheries Committee. For more information: Frank Halfmoon, Symposium on Indian Fisheries, P.O. Box 14929, Portland, Oregon 97214, 503-231-6749.

**July 12-13** — Northwest Power Planning Council meeting at the Grouse Mountain Lodge in Whitefish, Montana.

**August 9-10** — Northwest Power Planning Council meeting at the Valley River Inn in Eugene, Oregon.

**September 13-14** — Northwest Power Planning Council meeting in Idaho.

A more detailed calendar of Council committee meetings and consultations is carried each month in Update! See order form on back cover.

*Compiled by Ruth L. Curtis*

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The Northwest Power Planning Council is required to develop a program to restore the Columbia fisheries and a regional electric energy plan, to be carried out by the Bonneville Power Administration, emphasizing cost-effective conservation and renewable resources.

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Art Director: Stephen Sasser  
Editorial Board: Ruth Curtis,  
Gordon Lee, Daley Mahar  
Production: Mary Todd

## COUNCIL PUBLICATIONS ORDER FORM

Please send me a copy of the following publications of the Northwest Power Planning Council. (Note: not all publications are available immediately; but they will be sent to you as soon as possible.)

### Publications

- (89-1) 1989 Supplement to the 1986 Northwest Power Plan (available in mid-May)
- (89-1A) Appendices: 1989 Supplement to the 1986 Northwest Power Plan
- 1987 Columbia River Basin Fish and Wildlife Program
- 1986 Northwest Power Plan
- (89-8) Issue Paper: Assessment of Regional Progress Toward Conservation Capability Building
- (89-9) Issue Paper: Bidding for Resources
- (89-10) Issue Paper: Regulatory Barriers to Conservation
- (89-12) Draft Northwest Power Planning Council Budget for Fiscal Year 1991 and Fiscal Year 1990 Revised
- (89-13) Draft 1989 Northwest Power Planning Council Annual Report (available in early July)
- (89-14) Staff Monitoring Report of Bonneville Power Administration's Actions in Response to the Conservation Objectives of the 1986 Action Plan

### Mailing Lists

Please add my name to the mailing lists for the following newsletters. (Note: do not check if you already are receiving them.)

- Northwest Energy News* (this bimonthly magazine)
- Update!* (monthly public involvement newsletter that contains the Council meeting agenda, deadlines for public comment and a more detailed publications list)

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(Or call Judi Hertz at the Council's central office, 503-222-5161, toll free 1-800-222-3355 in Idaho, Montana and Washington, or 1-800-452-2324 in Oregon.)

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