the HIGH COST *of* FREE WATER

By Ernie Niemi and Ed Whitelaw

Unless we straighten out the way we allocate water rights in Oregon (and elsewhere), the coming shortage could be an economic catastrophe.

"There is no such thing as free water." (paraphrasing Harvard economist Alvin Hansen)

Headlines:

"Scientists find herbicides cause frog sex change"
—Reuters

"Flushed hormones change sex of fish,"
—The Ottawa Citizen

"The gender benders: Are environmental 'hormones' emasculating wildlife?"
—Science News

"America's waterways contaminated by medications, personal care products"
—Associated Press

"Drugs in drinking water"
—National Public Radio

"Killer cocktails: Drug mixes threaten aquatic ecosystems"
—Science News

In 1776, when we as a nation were young and we as a people were few, the nation's and globe's fresh water was abundant. There was enough to meet our direct demands — for drinking, irrigating, and carrying away wastes — and to support the natural productivity of most ecosystems. Today, we are many, and fresh water is scarce. That is, there isn't enough water — in the right place, at the right time, with the right characteristics — to satisfy all our demands. By all indicators, water will become far more scarce in the future, raising some serious questions: Will there be enough water to drink? To irrigate crops and lawns? Will the water become so polluted that it injures fish and other creatures living in the water or harms the children who eat the fish, drink the water, or swim in the streams? Can we do anything about it?

The worldwide water problems are immense, with many dimensions. About 40 percent of the world's population face water shortages, a figure that is expected to grow to 67 percent (five and a half billion people!) by 2025. By some accounts, more than a billion people, or one in six, are exposed to illness or death because they do not have access to a supply of safe drinking water. In a recent talk at the UO, former U.S. Senator Paul Simon cited United Nations statistics that say that 9,500 children die every day because of poor quality water. Increased risks of floods, plummeting fish populations, and other consequences of water-related environmental degradation also pose health threats and cause widespread economic damage. Studies from twenty countries indicate that about 17 percent of freshwater species warrant inclusion in the *Red List of Threatened Species*. Dead and diseased fish mean bad water, and, eventually, sick and suffering human beings. The cleaner the water, the healthier the fish, and the healthier the humans relying on the water and the fish.

Even the sometimes soggy Pacific Northwest suffers from too little water. We're not talking just about the current drought, though recent dry years have focused attention on concerns about water quantity. In 2001, the flow of the Columbia River was the second-lowest since 1929, and although some areas have since returned to more or less normal conditions, many parts of the region have experienced continued drought conditions and must confront the possibility of persistent water shortages. But because weather conditions can change quickly, it helps to remember that water shortages or scarcity stem from both supply and demand. Even if the supply of water in the Pacific Northwest remains normal, the growing demand for water — from families, firms, and farms — increases the scarcity. Increasing problems with water quality make the scarcity even more severe.

Want safe drinking water? Buy bottled water if the water in your tap comes from streams or wells polluted with hard-to-remove chemicals from agricultural fields, urban runoff, and municipal-industrial discharges — and there's a good chance that's true if you live in Oregon.

Want to go swimming? Stay away from the lower Willamette River whenever Portland's water-treatment facilities overflow and discharge raw sewage.

Want to catch some fish or shellfish to eat? Check first with Oregon's Department of Human Services and Washington's Department of Health to learn where mercury, sewage, or other pollution has rendered them unfit.

Want your children to enjoy a legacy of healthy streams throughout the region?

U.J O.

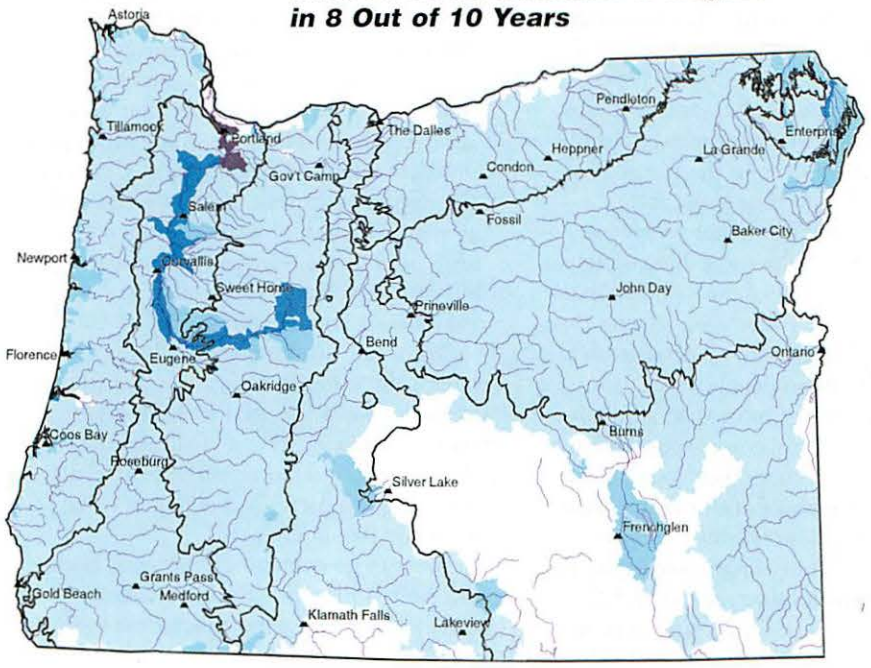
All Western states have designated trout/salmon species as their state fish — every one of which is threatened with extinction in all or a portion of its range.

Washington: Steelhead Trout
California: Golden Trout
Nevada: Lahontan Cutthroat Trout
Arizona: Apache Trout
New Mexico: Rio Grande Cutthroat Trout
Idaho, Montana, Wyoming: Cutthroat Trout
Colorado: Greenback Cutthroat Trout
Oregon: Chinook Salmon

Forget it, unless we reverse the conditions typified by the *Oregon State of the Environment Report 2000*, which found that "45 percent of Oregon's freshwater fish species have declined or are at risk of extinction. Among the fifty states, Oregon ranks fifth [measured by] the greatest number of fish species listed [under the federal Endangered Species Act]."

Water in this region will become much more scarce in the future, as demands further outstrip supplies. Demands across the board will increase as the population grows — it is expected to double by mid-century or so — and the economy expands even more. Some demands will grow faster than others, particularly as higher incomes stimulate demands for high-quality water in streams and for drinking. Lest this key point pass unnoticed, we'll repeat it for emphasis. As U.S. and Pacific Northwest households become wealthier, they demand — and are willing to pay for — greater environmental protection, cleaner streams, and healthier fish.

Unused Water Available in August in 8 Out of 10 Years



From *Oregon State of the Environment Report 2000*

In most years, Oregon's current water supply is fully- or over-allocated during the driest months.

At the same time, supplies are expected to shrink in many places, especially in the dry seasons. Unless urban growth patterns change dramatically, population and economic growth will cover thousands of acres with new parking lots and other impervious surfaces, causing winter rains to rush into the rivers rather than soak into the ground, move slowly toward the rivers, and reappear as summer flows. In addition, widespread reductions of more than 10 percent in summer flows will occur if predicted climate changes materialize, raising temperatures and shrinking snowpacks, thereby reducing summer runoff.

The economic and social problems arising from water scarcity are large and will get worse, interfering with jobs and incomes, draining money from pocketbooks, and diminishing the environmental and economic legacy we pass to our children.

What can we do about it? Even if we wanted to, we couldn't do much to slow the inevitable growth in our region. Climate change involves natural processes and global issues. Pollution of our water sources has at least received attention from policymakers — though far too frequently, we seem to make progress on one type of pollution only to discover we're losing ground somewhere else. For example, our apparent progress in coping with the effluent from industrial and municipal pipes has been upstaged by the cumulative contamination from the ubiquitous medications and personal-care products that have turned our rivers and streams into chemical cocktails.

But with water, scarcity-related problems don't arise simply from population growth bumping against a fixed and threatened supply of water. Beyond the apparent sources of our water scarcity lurk the less obvious, more insidious, and ultimately more burdensome sources of scarcity that stem from our system of allocating water. We've made a bad situation far worse than it need be. To assure the most effective response to the scarcity-related problems we know are coming from population growth and climate change, we must change the way we allocate water. And, with sufficient will, we can.

Water Rights and Wrongs

When water deals were first struck in Oregon, Washington, and the rest of the West in the late nineteenth and early twentieth centuries, the only ones at the table were those who wanted to grab and hold what they could. Had an economist been at the table, she probably would have been shot for introducing the inconveniently complicating notion of efficiency. Those self-serving deals, of course, still apply. Thus, instead of managing our water for efficiency — which to economists means generating the greatest economic value — we're stuck with inefficiency, the bane of economists and society alike. So we have a system in which innovation, imagination, and the demands of an evolving economy are overwhelmed by special interests and bureaucracies lurching and muddling to protect water users and uses that might have made sense in the nineteenth century when these vestigial deals were struck.

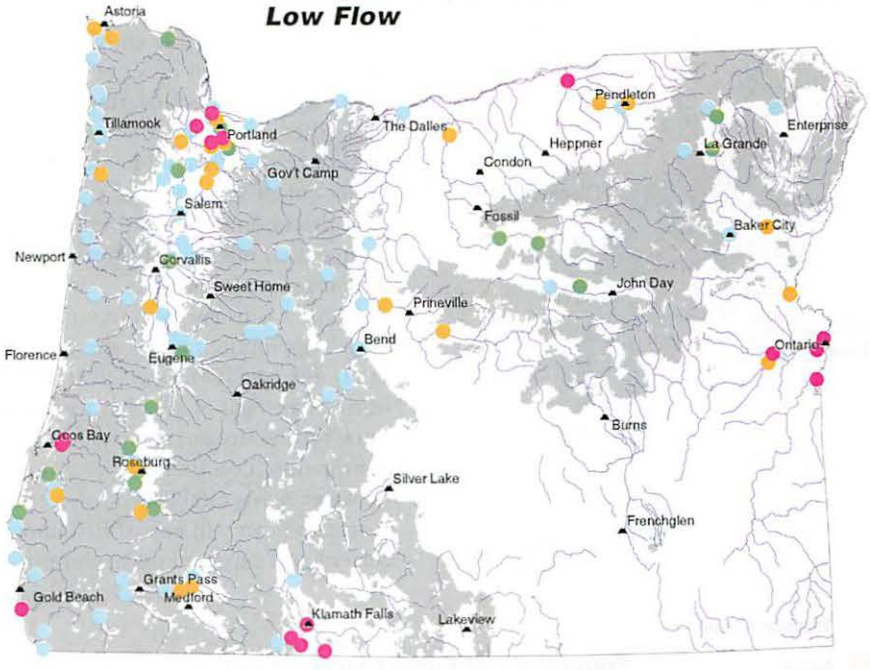
As with other states in the West, Oregon manages water according to a legal doctrine, called prior appropriation, developed 150 years ago in California's gold fields. With few exceptions, all water is owned by the state, which issues rights to use the water to households, farms, firms, water utilities, and local governments. A water right specifies the location and type of the allowed use, the amount to be used, and the "priority date" when the right was established.

The water rights for a given basin form a queue of claims on whatever water exists at a given time: those with earlier priority dates elbow ahead of those with later ones, and the system allocates water along the queue, beginning at the front. The earliest water right must be fully satisfied before the one behind it can exercise its claim, and so on until the available supply of water is exhausted. If there is not enough water to satisfy all water rights, those at the end of the queue go without, even if the values associated with their uses exceed, even greatly exceed, the values of the water rights closer to the front of the line. Thus, instead of rewarding innovation and imagination by continually reallocating water from economically tired uses (e.g. irrigating crops that lose money without government subsidies) to energetic ones (e.g. leaving water in streams for healthy fish runs), the water-rights system insulates those at the front of the queue from all economic pressures.

Data for the Willamette Basin illustrate how the system works. Some water rights protect in-stream flows for fish and wildlife, but most claim water for irrigation, municipal utilities, and other out-of-stream uses, or for in-stream commercial uses, such as driving hydropower generators. Of all the basin's water allocated to water rights by 1998, 40 percent was for rights established before 1960 — predominantly agriculture and hydropower. Only 4 percent was for uses established in the 1990s. Water rights aimed at keeping water in streams constitute about

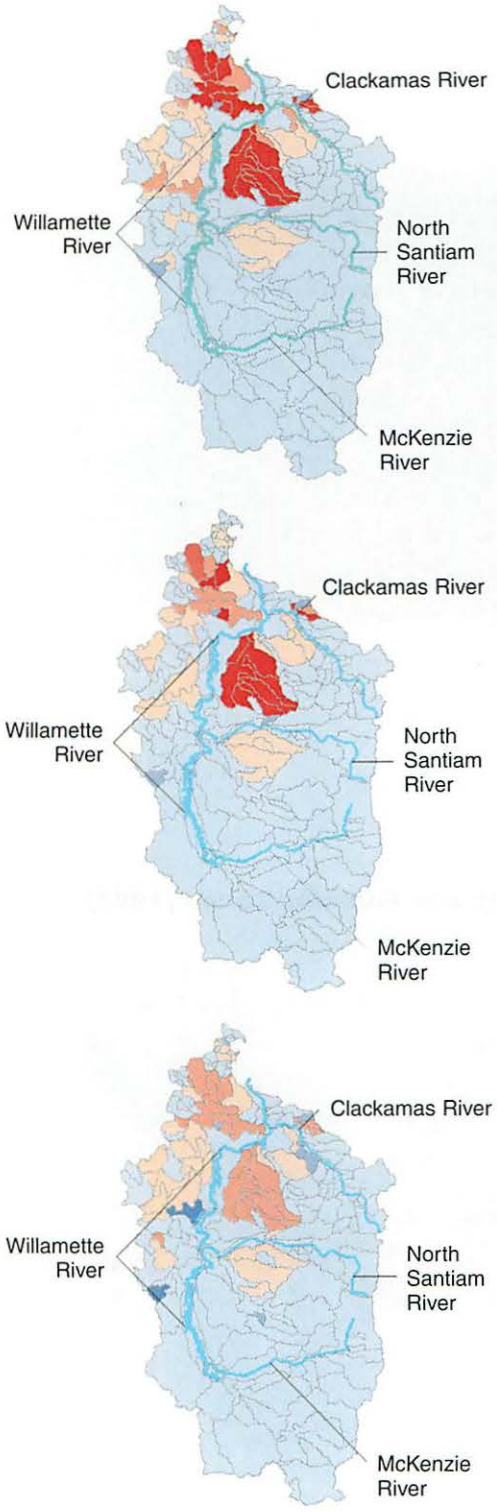
"Occurrence of tumors, lesions, and deformities in fish is a direct measure of fish health.
Systematic data are not available statewide, but in the Willamette River skeletal deformities comprised less than 5 percent of the sampled fish population upstream from Corvallis, 20 percent between Corvallis and Newberg, and there was a 56 percent incidence rate in the Newberg pool [between Newberg and Willamette Falls]."
— Oregon State of the Environment Report 2000

Water Quality and Forested Lands (1997) Low Flow



From *Oregon State of the Environment Report 2000*

Good or excellent water quality is usually found in higher altitude forests. Poor or very poor quality is more likely to be found in "non-forested lands where intensive land uses and land conversion have occurred."



Projections of August streamflows for the Willamette Basin in 2050 (relative to 1990) under dry year conditions, based on three different development scenarios: present development trends and policies continue (top); greater reliance on market-oriented approaches to land and water use (middle); priority given to ecological services (bottom).

From *Willamette River Basin Planning Atlas*

40 percent of the total water rights issued for the basin, but they lie largely at the end of the queue: two-thirds of the water rights for out-of-stream uses were already in place before the first in-stream right was issued in 1963. About 40 percent of the water withdrawn from streams or wells is consumed by crops, evaporates, or is lost to seepage. The remainder is delivered to streams after it is used, often containing biological, chemical, or thermal pollutants that mix with those carried by stormwater runoff from urban streets, farm fields, and other lands.

For most areas, we've given away more than nature can supply. Water rights already issued exceed the amount of stream flow during the driest part of the summer for all parts of the basin, except sections of the high Cascades and the main stems of the McKenzie and Willamette Rivers, where flows are augmented by releases from large dams. If present trends continue until 2050, municipal-industrial diversions would increase by 20 percent, relative to 1990, and agricultural diversions of surface water during dry, summer months would double, as farmers irrigate more acres with water stored behind the basin's federal dams and more consistently take their full allotment of water under each water right. In the Tualatin, Molalla, and other sub-basins, the total supply of surface water would be diverted under out-of-stream water rights in drier-than-normal years, even if climate change does not bring hotter, drier summers more frequently.

Other basins are even more extreme in their appropriation of water resources to out-of-stream uses, especially irrigation. Nearly 80 percent of all water withdrawn from Oregon's streams and aquifers is used for irrigation. Less than 20 percent of the water rights established to protect in-stream flows will be satisfied under current and expected usage patterns.

The prior-appropriation queue is a dream for those at the front of the line but a nightmare for both the economy and the ecosystem. The ecological damage is pervasive. More than half the fish in the lower Willamette River are afflicted by skeletal deformities. A recent study of eight species of native Western trout, which serve as indicators of overall ecological health, found strong or genetically intact populations are limited, on average, to less than 5 percent of their historic range, and for three of the eight, to less than 1 percent. Oregon, along with every other Western state, lists a species of trout or salmon as its "state fish," and every one of these is threatened with extinction in all or a portion of its range. In a typical Western river basin, about one-quarter of all fish species are in serious decline or facing a substantial risk of extinction.

Economically, the costs and risks are equally severe and widespread. Whenever any resource — water, land, labor, and so on — is employed in a low-value use while a higher-value one goes unsatisfied, we forgo the incremental increases in our prosperity and standard of living. The queue of water rights, with those at the front locked in place more than a century ago, cannot serve today's economy well, and it will fail even more miserably in the future.

Consider how the system has spawned the water crisis in the Klamath Basin. In 2001, concerns about threatened and endangered fish caused federal agencies to deny the use of federal facilities to provide irrigation water to farmers along the Oregon-California border. Then, in 2002, the headgates were opened, but the resulting low stream flows were linked with the death of more than 30,000 salmon near the river's mouth. Throughout the period, the system readily allowed farmers outside the federal project to irrigate low-value crops on poor soils. A study of the 2001 events found that the value of irrigation water varied from field to field by a factor of twelve, reflecting differences in soil productivity, and that the overall cost to the agricultural sector could have been reduced by 80 percent by introducing market-like mechanisms to shift irrigation water from low-value to high-value fields. This finding raises the possibility that the subsequent fish kill — indeed, the entire crisis — could have been avoided if the

water-allocation system had been amended to incorporate widespread use of markets and market-like mechanisms so that, as the economy evolved, water rights could have shifted from low- to high-value uses.

Another example emerges in the adjacent Upper Deschutes River Basin. Here, urban water users in the Bend area, who use about 20,000 acre-feet of water per year, are facing possible water shortages that could limit future growth. At the same time, the area's irrigation districts, with some of the oldest water rights in the state, divert almost 850,000 acre-feet —and more than 500,000 acre-feet of this is lost to seepage and evaporation. To date, efforts to shift water from low- to high-value uses have been futile, and recent elections seem to have reinforced the position of proponents of the status quo.

Some innovations have managed to sneak through this regulatory labyrinth and bring the water-management system into the twenty-first century. The 2001 electricity crisis prompted some utilities to pay farmers to forgo irrigating fields so the water could remain in rivers and pass through hydropower generators. Oregon Water Trust and similar organizations occasionally pay landowners to leave water in streams. Municipal water utilities face a new requirement to develop plans to conserve water. The Oregon Water Resources Department is trying to bring about significant water conservation in the Deschutes Basin. But let's not fool ourselves. These are Band-Aids. Unless and until water uses extensively reflect the values of the current economy and routinely respond to future climatic, ecological, and economic shifts, we will remain in a constant state of crisis.

Reversing the Flow

Professors Bill Jaeger, of Oregon State University, and Raymond Mikesell, of the UO, recently looked across the Northwest and concluded that, if we had appropriate institutional mechanisms in place to facilitate exchanges between willing buyers and sellers of water rights, we could augment stream flows to provide for fish and other ecological benefits at a cost of only $1 – $10 per person per year. What would these mechanisms look like?

The ideal would be for Oregonians to rework the whole water-rights system, building in provisions for adaptation as economic and environmental conditions change, and for water to be extensively traded in open markets. More feasible are market-like mechanisms, such as short-term cash transactions that induce someone with a water right for an out-of-stream use, such as irrigation, to leave water in the stream for fish and wildlife. Other mechanisms that have been tested include water banks and easements that provide a landowner compensation in return for accepting limits on the use of land and water. More broadly, we have to consider the application of financial tools that allocate and spread the risks associated with water scarcity, tools such as insurance that would cover a farmer's losses whenever ecological conditions warrant leaving water in streams for fish and wildlife.

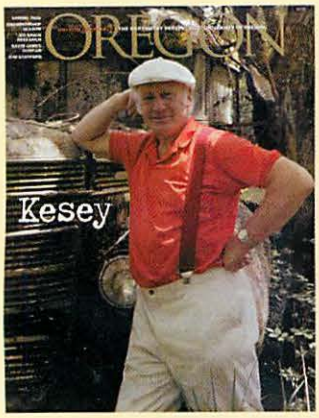
We're no more likely to find free water than we are to get the free lunch that Harvard economist Alvin Hansen warned us about. What we do or don't do with water imposes a cost. Our choices determine, among other things, who pays and when. We can pay now or make our children pay. Our forbears clung to the rigid water-management system they created and passed the bill to us. Through the shrewd greed of a few, the inertia of an entrenched bureaucracy, and the ignorance of far too many of the rest of us, we're still clinging to the same damn system. C'mon. We can change it. Unless we find the political will to do so, expect the distant trickle you hear about the coming water crisis to turn into a roaring flood coming right at you.

Ernie Niemi '70 is vice president and senior economist at ECONorthwest, an economics consulting firm. Ed Whitelaw is a professor of economics at the UO and president of ECONorthwest.

"Computer models predict that the Northwest will become gradually warmer and wetter, with most of the precipitation increase in the winter. *The average of seven models estimates that within the next fifty years temperature will increase by more than five degrees Fahrenheit in the winter, precipitation will increase 5 percent, average snow depth will decrease by 33 percent, and annual stream flow will decrease by 11 percent."*
—Oregon State of the Environment Report 2000

Advisories

Is it safe to eat fish from Oregon and Washington streams? Better check. Oregon: Oregon Department of Human Services: Oregon Public Health Services, Ken Kauffman, (503) 731-4015 http://www.ohd.hr.state.or.us/esc/fishadv.htm. Washington: Washington Department of Health: Office of Environmental Health Assessments, 1-877-485-7316 http://www.doh.wa.gov/ehp/oehas/EHA_fish_adv.htm.



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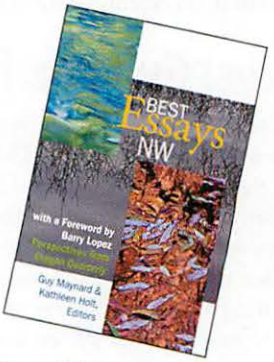

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