River Voices

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The Water Efficiency Revolution

by Andrew Jones and Jim Dyer

As conflicts over water worsen, many people wonder where we'll get water for the future. "More gallons!" scream the cities. "Not our water!" cry farmers and ranchers.

Traditional water suppliers overflow with answers: Dam a river. Dig a well. Build a pipeline. Then the dreamers chime in: Drag an Alaskan iceberg to Los Angeles. Fill water tankers with Canadian rivers and ship the wet stuff down.

But recently, innovative water suppliers have discovered more mundane sources. They have found quantities of water amounting to small rivers flowing through our homes, our businesses, and our city streets. And often these untapped sources of water are already treated, heated, and ready for use.

What is this mysterious source? The rivers come from our lawns, faucets, agricultural irrigation ditches and industrial cooling systems - from water that is used inefficiently.

Let's consider gains made by tapping into just one of those rivers: Water lost through the use of inefficient showerheads. Installing efficient showerheads in 80% of U.S. households would produce a supply of over 1000 million gallons of water a day - the yield of ten large dams. The resulting electricity saved would equal the output of three Chernobyl-sized power plants and reduce carbon dioxide emissions by 20 million tons each year.

A Cost-Effective Source

Water efficiency can supply needed water, protect our rivers, and even slow global climate change. Surely it is too expensive. Right?

Water efficiency offers many rewards: providing a cheap new source to the water utility, energy supplies to gas and electric utilities, economic development and jobs to the community, protection and enhancement to the local environment, conflict resolution to competing groups, and time to plan a sustainable future.

Wrong. Water efficiency programs such as distributing high-efficiency showerheads and faucets deliver new supplies of water and energy at the fraction of the cost of any new supply. The average U.S. homeowner pays around $1.56 for a thousand gallons of drinking water. Most new supplies cost much more than that - Santa Barbara's new desalination plant, for example, will turn seawater to drinking water for $5.80 per thousand gallons, over 3.5

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Inside *River Voices*

This issue of *River Voices* focuses on using water efficient technologies and conservation as a river protection tool. Improving the efficiency of municipal and agricultural water use can protect rivers in numerous ways, such as providing alternatives to water supply dams and decreasing the need for more diversions while protecting water quality, natural habitat and recreational opportunities. The following collection of articles provides background information, examples of how river advocates are using these technologies and programs, some practical advice and lists of references.

Many thanks to Andrew Jones, Jim Dyer, and Scott Chaplin of Rocky Mountain Institute for suggesting we address this theme and providing guidance in developing this issue.

RIVER NETWORK

PO Box 8787
Portland, OR 97207
(503) 241-3506
or (800) 423-6747
EcoNet: rivernet

River Network is a national non-profit organization dedicated to helping people protect rivers. We support river conservationists in America at the grassroots, state and regional levels; help them build effective organizations; and link them together in a national movement to protect and restore America's rivers and watersheds.

River Network has three programs:

the **River Clearinghouse** provides local river activists with information and referrals on technical river resource and non-profit organizational issues;

the **River Leadership Program** develops new leadership and strengthens existing programs in the river and watershed protection movement at the state, regional and grassroots levels;

the **Riverlands Conservancy** brings critical riverlands into public ownership, thereby empowering the public to oversee management and protection.

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times the national average. Compare that to the cost of water from a plumbing fixture retrofit program - around $0.70 per thousand gallons, or one-half the average.

"But we've seen these technologies before," says the cynic. "They give us wimpy showers and brown lawns."

Water efficiency has improved since the crumbly-bricks-in-the-toilet programs of the 70s. The new technologies work just as well or better than the old ones, while using less water. Consider faucet retrofits. An unrestricted flow of water out of a tap is shapeless and sloppy. Much of the water splashes off a glass being rinsed. A high-efficiency faucet retrofit device with new laminar flow technology produces a clear stream with greater wetting abilities. It rinses better. People don't know that they are using half the water and energy and thus will save around 3000 gallons of water and 200 kilowatt-hours of electricity each year in their household.

Water suppliers invest in water efficiency for sound business reasons rather than to increase customer satisfaction. Soggy Seattle is a case in point. Faced with persistent population growth, the Seattle Water Department will rely on water efficiency as the sole source of additional water for the 90s. "Conservation is the best way to go, " says Judi Gladstone, water resource planner. "There is no sense in developing new supply projects until we really need them. We can supply water cost-effectively through the turn of the century without sacrificing quality of service."

Seattle will give away efficient showerheads, audit homes, promote installation of efficient toilets, and implement other programs. By 2002, this will supply approximately 12 million gallons of water per day, at an estimated cost of $15.9 million. Water from another supply project, a diversion of the North Fork Tolt River, will cost almost three times as much.

The Energy Bonus

The benefits of water efficiency run further than supplying water at a 66% discount. Seattle City Light, the electricity supplier, is helping fund the water efficiency program because it will save approximately 28 million kilowatt-hours of water heater electricity by the year 2000. That is $1.1 million dollars of savings to the people, and enough electricity to power 4,500 electrically-heated homes each year. Seattle's is the largest of a growing number of partnerships between water and energy utilities, from Connecticut to Southern California.

As Seattle is showing the water community, utilities can supply water

***River Voices*, a quarterly publication of River Network**

River Voices is a forum for information exchange among the national network of grassroots, state and regional river groups. We welcome your input for topics, articles, announcements, Letters to the Network, and anything else that you think would be of interest and assistance to other river advocates.

Water Efficiency as a River Protection Tool

* Provides an alternative to more water supply dams and their detrimental ecological and socioeconomic impacts.
* Provides an alternative to more diversions from rivers, maintaining instream flows for fish and wildlife habitat and recreation uses.
* Provides an alternative to dewatering more wetlands, maintaining valuable wildlife habitat, natural mechanisms for regulating floods and filtering pollution.
* Protects water quality. Less wastewater means less expensive treatment and less effluent. Treatment plants receive less wear and tear. Reduces the frequency and severity of combined sewer overflows and accidental dumpings of untreated or inadequately treated wastewater. Keeps greater flows in the river to dilute pollution.
* Saves energy by using less electricity to heat and treat water. Less demand for energy means less need for hydropower dams.
* Buys time to develop more sustainable technologies, management schemes and lifestyles.

more cost-effectively through efficiency programs. This simple fact has proved to be a powerful tool for planners who are looking for viable alternatives to a dam or diversion on their river. Consider the proposed Two Forks Dam, outside Denver, Colorado. Distributing efficient toilets, showerheads, faucet aerators, and outdoor watering assistance to all Denver residents could supply as much water as the dam, at about one-fifth the cost. For this, and many other reasons, William Reilly, director of the EPA in the Bush Administration, vetoed the dam.

Now the Cahaba River Society of Birmingham, Alabama is discovering similar opportunities for water efficiency in that region. Municipal retrofits, leak repair, and wastewater reuse on golf courses could supply desired water in the Birmingham area, helping to avoid the need for a dam on the Locust Fork River. The efficiency programs would increase profits for the water utility, save money for the city, and protect the environment — truly a win-win resolution to a growing conflict.

The water field needs such conflict resolution. Ranchers, cities, and environmentalists feud in the Western United States. Turkey, Syria, and Iraq wrangle over the Euphrates River. And tensions in the Nile basin drove former Egyptian president Anwar Sadat to say, "The only matter that could take Egypt to war again is water." While water efficiency is not a panacea, it can help ease the shortages that ignite these crises.

Diffusing conflicts, keeping water in rivers, using less energy — these actions are vital to environmental sustainability. And the ecological implications continue: lower flows through wastewater treatment plants can allow them to treat water better and less expensively, sending cleaner water back to lakes and rivers. And energy savings achieved through reduced heating, treating, and pumping loads can help slow global warming and reduce acid rain.

A Word of Caution

Water efficiency, then, is a sharp sword that cuts water use, energy use, and environmental disruption. It can, however, carry a second, dangerous, edge -- business as usual.

In the absence of meaningful regional planning, thirsty suburban sprawl may suck up all the "new" water supplied by efficiency programs, ironically bringing dirtier air, messier traffic jams, and, sooner rather than later, the call to dam the river after all.

As Kurt Beardslee, of Washington Trout, a fish conservation organization located outside Seattle, says, "It is a nightmare. The public is primed to do the right thing — they want to be good to the Earth and use less water. But water conservation could be the worst thing of all." Unless...

Unless water efficiency goes hand-in-hand with river conservation. Unless a portion of saved water goes back to the environment. Useful models exist. Oregon passed a law in 1987 that regulates water saved through efficiency improvements. The law states that 75% of saved water could be sold, and 25% goes to the state to supplement river flow. While obstacles to effective implementation remain, the law is an encouraging step toward restoring the environment.

Perhaps more importantly, water efficiency can buy time — time to develop more sustainable technologies,

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Water Efficiency: An Alternative to Water Supply Dams

by Rita Haberman

The U.S. has plenty of dams — over 75,000 large dams and at least 2 million smaller impoundments — that have been built for various purposes, some of which include flood control, hydroelectric power and water supply. Providing the public with water supply has been one of the foremost reasons for dam building in the United States (Coyle and Brown, 1992).

It appears that the era of building high-capacity, publicly supported dams that inundate huge land areas has ended, and with the Clinton Administration that trend is likely to continue. The construction of smaller dams, however, still threatens the natural values of many of the nation's rivers. Although the greatest pressure to build dams today comes from the advocates of hydropower (Coyle and Brown, 1992), municipalities thirsty for water supplies also continue to be a serious threat. Examples abound throughout the country. The City of Columbus, Ohio is considering damming the Scioto River. A few rural counties in Oregon, with support from the U.S. Bureau of Reclamation, have proposed to dam Willamina Creek in rural northwestern Oregon. The City of Birmingham wants to dam the Locust Fork of the Warrior River. The City of Lexington is considering building more dams on the Kentucky River.

Fortunately, there's a promising strategy for advocates of free-flowing rivers opposing dams for water supply purposes — water efficient technologies. The strategy played an important role in defeating the Two Forks dam on the South Platte River in Colorado, and it seems to be working on the Locust Fork in Alabama. The story of these two efforts, full of ideas and advice, follows.

The Defeat of Two Forks Dam

The South Platte River originates in the Rocky Mountains near the center of Colorado and flows generally northeastward through Denver and on into Nebraska. About 65 percent of the population of Colorado is concentrated in a 30-mile wide area along the South Platte, and for years the Denver Water Department had its eye on the Platte as a long-term water supply for the Denver metropolitan area.

In 1981, the Denver Water Department proposed Two Forks Dam, a $1 billion dollar project to create a 1.1 million acre-foot reservoir. The Two Forks reservoir project would have flooded 30 miles of river, 21 miles of which are designated by the state as "Gold Medal Trout Waters." The South Platte is also the largest remaining flowing water resource of Colorado's front range in the vicinity of Denver. The reservoir would have destroyed diverse recreational opportunities for fishing, kayaking, camping, scenic viewing and other activities.

Throughout the decade-long Two Forks battle, environmental interests pushed for water efficiency as an alternative to the project. Repeatedly, they faced adamant opposition from the Denver Water Department and the U.S. Army Corps. Colorado environmentalists joined together to form the Colorado Environmental Caucus to fight Two Forks. The Caucus tapped into the technical expertise of the staff of the Environmental Defense Fund, university professors and others to develop a credible scientific case against the dam and to propose an alternative. They developed a two-phased approach to meet the near and long term water needs of the Denver area. The plan included a combination of water projects, water exchanges, water reuse, water efficiency measures, groundwater development, and even one or more structural projects. The Caucus was able to get the U.S. EPA and the Governor to acknowledge that improving water efficiency was a technically feasible and cost-effective option to consider as part of solution to Denver's water supply issue.

In 1989, Rocky Mountain Institute (RMI) published a report analyzing how much water and money could be saved if Denver retrofitted residential homes with water efficient devices rather than building Two Forks dam. Although the report came out too late in the battle to be formally acknowledged in the environmental impact review process, the findings are well worth noting:

> **"Full use of new water-saving equipment in Denver households would save more water than the proposed Two Forks dam would supply, and at about 20% of the dam's cost per acre-foot. The hardware required — high-performance toilets, showerheads, faucet aerators, and lawn-watering equipment — is all commercially available. Proven ways to finance and deliver it are also available and are being successfully used by utilities across the country."**

In November 1990, the U.S. Environmental Protection Agency vetoed Denver's plan for the Two Forks Dam. Under the authority of Section 404(c) of the Clean Water Act, the EPA denied the permit after determining that the proposed project would result in unacceptable adverse effects on

fishery areas and recreational areas. The EPA grounded its decision on the fact that less environmentally damaging alternatives were available to meet Denver's metropolitan water supply needs. "Ultimately, the EPA did not base its decision on conservation alternatives, but it certainly played a role in their decision," explains Dan Luecke of Environmental Defense Fund.

Dan Luecke, a leader of the Caucus, offered some advice and encouragement to river advocates battling water supply projects, "Realize it's an uphill battle, but things are changing." Utilities don't like to be told what to do. They will question your credentials while resting on their good reputation of serving the public. Activists can put together a credible analysis and plan, but it requires recruiting the help of some experts. The Caucus's sound scientific analysis and presentation of alternatives was undeniably an essential component of stopping the dam, but it's also worth noting the well orchestrated campaign also included savvy strategies of political pressure and media attention.

Since the veto, the Denver Water Department has incorporated water conservation into its programs. The Department's promotion of water efficiency among its 891,000 consumers has apparently worked; in 1992 the average consumer used 9% less water than in 1989. Recently, the Denver Water Board completed its metering program ahead of schedule and below budget costs. Full metering of Denver is expected to cut total water use within the city by about 10 percent, or some 10,000 acre feet of water a year. This savings is enough, say Water Board officials, to supply about 40,000 new residents each year.

The Fight to Keep the Locust Fork Free-flowing

The Locust Fork of the Warrior River is one of Alabama's most outstanding free-flowing rivers. It offers some of the best fishing, canoeing, and natural scenery in the state, in a location easily accessible to Birmingham, the state's largest metropolitan area. The Locust Fork River also provides habitat for an unusual diversity of life.

The Locust Fork River, Alabama. Photograph by Beth Maynor

A group of concerned citizens organized in response to a proposal by the Birmingham Water Works (BWW) to dam the Locust Fork River. The new group, Friends of the Locust Fork River, was looking for some help and contacted the Cahaba River Society (CRS), Alabama's largest river conservation group.

Friends of the Locust Fork, CRS, and several other organizations joined forces and created the Coalition for a Free-flowing Locust Fork. Don Elder, executive director of CRS, knew of the EPA veto of Two Forks and the work of RMI. Elder wanted to take what they could of the arguments against Two Forks and apply them back home. RMI supplied the newly formed coalition with technical information, examples of successful programs, and an on-site visit from Andrew Jones, RMI research associate, to analyze the situation.

Rather than accepting the BWW's assumptions and plans to build a water supply dam, the coalition took a couple steps backward. They took nothing for granted and first wanted to analyze Birmingham's water needs and alternative supplies.

The coalition showed that there is no need for additional water and consequently no need for the proposed dam. To demonstrate this, they considered a wide variety of factors, including present and anticipated rates of per capita consumption, present and anticipated rates of population growth, likely increases in the size of the utility's service area, and the quantity of supplies presently and potentially available from existing water sources. They rebutted the BWW's questionable projected figures for consumption, population, and maximum day demands. Even using the BWW's figures, they still showed that there is no shortage of water in the Birmingham metropolitan area at the present time, nor is there likely to be one in the

(**Dams** continued on p. 15)

Water Conservation as a Means for Water Quality Protection

by Timothy Searchinger

Preserving water quality depends on treating human and industrial wastewater with expensive technologies. It also requires keeping a natural flow of clean water in a river or estuary to dilute wastewater dumped into it and to preserve natural adjacent wetlands. Because of these economic and environmental costs, limiting human consumption of water plays an important role in preserving water quality. Water conservation often provides the cheapest and most ecological solution to water quality problems.

Wastewater Treatment Costs

On the wastewater side, water conservation is fundamental because of the enormous expense of treating sewage water. For example, New York City's 14th and newest plant, North River on Manhattan's West Side, cost $1.2 billion and is designed to handle 170 million gallons per day. Yet, already, at the time of final completion, the plant has reached its design capacity. Without significant water conservation in this drainage area, the design flow at this plant will likely be exceeded, potentially requiring hundreds of millions of dollars in additional plant capacity — money that is badly needed elsewhere. New York City is already considering a $150 million expansion of its Newton Creek Plant.

Indeed, the flow of water into at least two of New York City's treatment plants already exceed their maximum designed flows. The Ward's Island Plant, prior to recent water conservation efforts, exceeds the design flow in some months by as much as 100 million gallons per day. Four other plants are virtually at their design capacity. For these plants, the high flows already may impede water quality by reducing the capacity of the plants to provide their full treatment. When plants exceed their design capacity, they may be forced to flush water through their aeration tanks faster than planned, which cuts down on the optimal retention time. It is not surprising, therefore, that overloaded sewage treatment plants, such as Ward's Island, often exceed their permitted discharge limits. Faced with a legal requirement to reduce flows at Ward's Island in 1989, New York City and the state agreed that the quickest and cheapest method was more aggressive water conservation.

High water flows add operating expenses in the form of energy and chemical additives. By increasing wear and tear on treatment plants, high flows increase maintenance and repair costs. High water flows also make plants more prone to upsets, when the organic breakdown process stops functioning, and large quantities of partially treated sewage can be discharged for days. New York City has suffered several severe upsets in recent years, pouring tons of untreated sewage into the harbor.

Nutrient Control

New York City's need for conservation has become increasingly severe due to long unaddressed water quality problems. Chief among these problems is the need for nutrient control. Typical sewage treatment plants are not designed to remove nitrogen. When excess quantities of nitrogen enter marine water, however, they may cause large algal blooms. Particularly when algae die and decompose, they draw oxygen out of the water and may even create conditions in bottom waters of virtually no oxygen. These "hypoxic" events in western Long Island Sound have been particularly severe, spreading almost from Throg's Neck to New Haven. Some scientific work has also suggested that nutrients may contribute to low dissolved oxygen in portions of the East River and New York Harbor, particularly in Jamaica Bay. More ominously, nutrient discharges in the harbor area exported to sea may play a major role in algal blooms and periods of low dissolved oxygen in the New York Bight, the stretch of coastal water for the tip of Long Island to the southern tip of New Jersey.

Extensive modeling in Long Island Sound has demonstrated that nitrogen discharges from New York City and Westchester sewage treatment plants must be reduced to remedy the hypoxia problems in Long Island Sound. The dominant techniques for removing nitrogen takes advantage of the existing infrastructure and works primarily by adjusting the oxygen content in different portions of a treatment plant's aeration tanks (creating alternate zones of high and low oxygen). But doing this would generally require an increase in overall retention time in the tanks, particularly in many of New York City's plants which now rely on short retention periods. If this retention time is increased by constructing additional tanks, the costs would be in the many hundreds of millions, probably billions of dollars, just for the six main plants that most directly affect Long Island Sound. But retention time can also be increased by decreasing the quantity of water entering the tanks. If New York City could conserve an average of 15 to 20 percent of its water flow, the costs of nutrient removal would be greatly reduced.

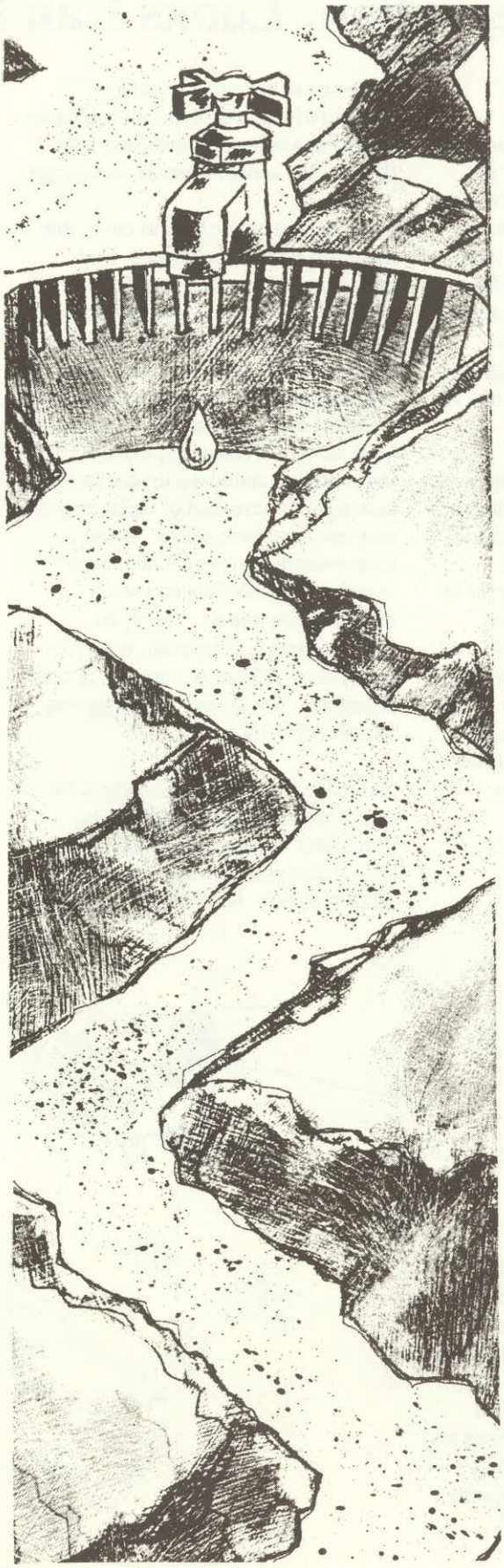
Combined Sewer Overflows

Apart from nutrient removal, New York City also faces an increased demand for treatment capacity to handle its combined sewer overflows. New York City's sewers, like those in many older urban areas, use the same pipes to handle sewage and rainwater. Even during a small rainstorm in New York, sewage treatment plants are overloaded, and a mixture of raw sewage and rainwater flows directly into the harbor. The most obvious results are floatable debris, increased concentrations of bacteria and viruses, and periods of extremely low dissolved oxygen.

New York City has embarked on a ten-year program to abate combined sewer overflows. An important proposed remedy in many areas should involve using sewer pipes and new underground tanks to store overflows and then to feed them slowly into sewage treatment plants once the rain stops. But how much can be stored and fed is restricted in part by the capacity of the sewage treatment plants. New York City has yet to reveal the impact these constraints have had upon its planning, but the need to treat some portion of sewer overflows will tax the already limited treatment plant capacities in the future. Water conservation can play a valuable role in lowering the flow to treatment plants during dry weather to create some excess capacity to handle rainfall overflows.

Ecological Impacts

Increased water supply also threatens water quality. Throughout the United States, diversions of water supply have dried up wetlands, causing them to lose their natural purifying capacity, and reduced freshwater flows to estuaries, changing their salt concentrations. Declines in water flows have also reduced the capacity of water bodies to absorb pollutants. The dams and reservoirs that accompany water supply have a wide variety of ecological effects, including adverse changes in water quality. In New York City, the prospect of water supply shortages has triggered efforts to tap the Hudson River through a pump station in Chelsea, New York. But the diversion of Hudson River flows threaten to pollute the reservoirs and rivers into which the waters will flow. It would also reduce the freshwater flow to the Hudson during already low-flow periods, allowing salt water to intrude farther up the Hudson. It would also divert some spawning fish. Water conservation can eliminate or reduce the frequency of these impacts by reducing the need for tapping the Hudson River for water supply.



Timothy Searchinger is a Staff Attorney for the Environmental Defense Fund in New York City. Mr. Searchinger has worked extensively in evaluating New York City's sewage treatment plants and their relationship to water quality. This article was originally published in East Meets West (full cite on p. 16), proceedings of a water conservation conference sponsored by Scenic Hudson.

Water Conservation: Looks Can Deceive

by Christopher Meyer

In recent years, urban and agricultural water conservation has become a dominant theme in the debate on water policy. Seeing enormous "waste" in water use, many policy makers have seized upon the idea that the gains achieved recently in energy conservation — such as improvement in electrical appliances, gas mileage, and insulation — should set the pattern for water conservation.

Indeed for some, the goal of conservation has become not just a question of efficiency, but one of ethics, a moral responsibility. This heightened interest in water conservation, now is being translated into government action, particularly at the federal level. Anyone who doubts it need only peruse the 1992 omnibus water bill for evidence that Congress, for one, is serious on the subject of agricultural water conservation. Meanwhile federal agencies, particularly the U.S. Bureau of Reclamation and the U.S. Environmental Protection Agency, are making noise about the need for greater attention to water conservation. This trend is surely not going to be slowed by the new administration.

From agricultural ditch linings to xeriscaping, the opportunities for savings are enormous. The demand for water conservation grows with every creature added to the endangered species list with every headline documenting the latest incident of water contamination. Federal laws and law enforcement are stronger than ever. States, too, are getting into the picture. Add to that intensified pressures to balance the national budget (which once financed enormous irrigation and sewage systems), and the result is a clear formula for change.

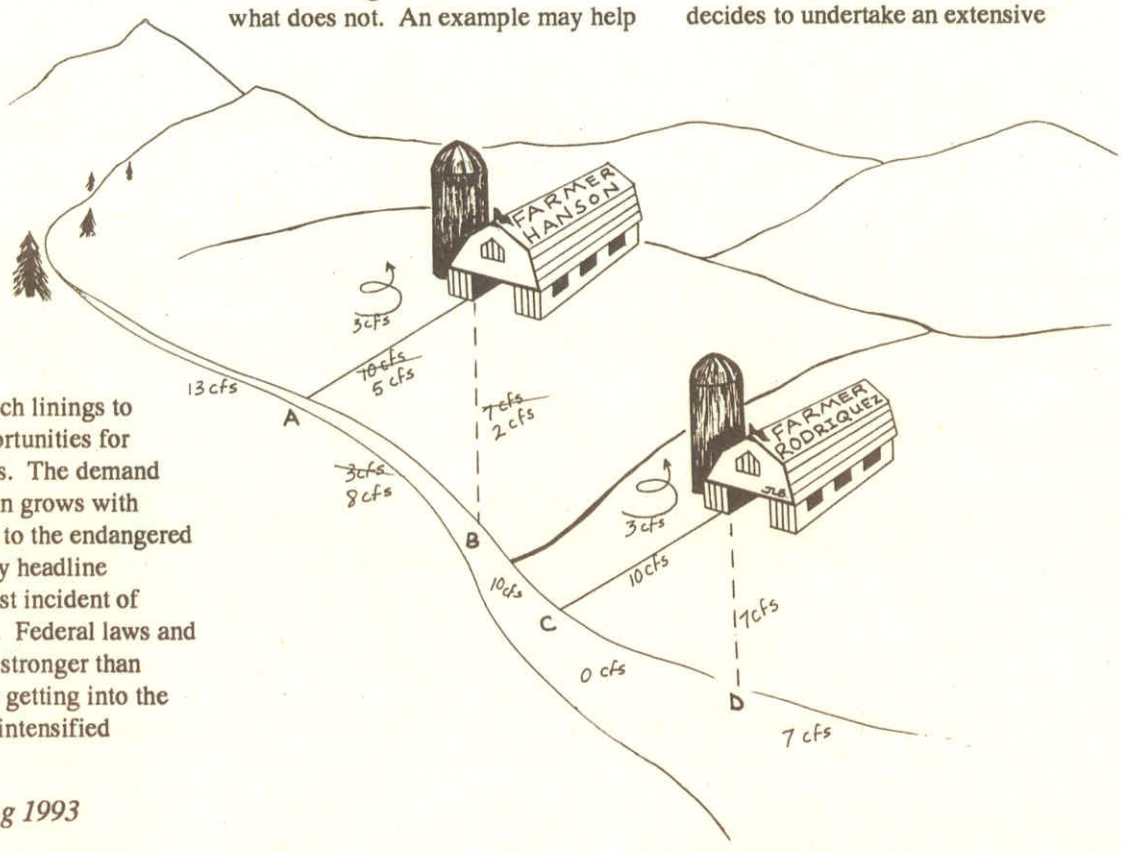
No attempt is made here to cover this large and important subject. One critical point, however, needs to be made. It is that water conservation, unlike energy conservation, sometimes involves robbing Peter to pay Paul. When an efficiency improvement saves a watt of energy, a watt of energy has been saved. When an efficiency improvement reduces a diversion by an acre-foot, an acre-foot of water may or may not have been saved. Water conservation is simply much more complex and interrelated than is energy conservation. This is so because energy, once used, is lost to the system. Water, in contrast, is used repeatedly; one farmer's savings may be another's loss.

This observation is not an excuse for doing nothing. Much needs to be done. But it is important that we be able to distinguish what works from what does not. An example may help to illustrate the point.

Consider the hypothetical below involving two rather inefficient irrigators. Suppose that Farmer Hanson and Farmer Rodriguez each own water rights to divert 10 cfs of water, and that each farm consumed only 3 cfs while returning 7 cfs to the stream through leaky ditches and so on. (The relative priorities of the farm are not relevant here. Regardless of priority neither farmer may make any change which injures the others.)

As a result of these diversions, what would have been a natural flow of 13 cfs, is reduced to 3 cfs between points A and B, 10 cfs between points B and C, zero between points C and D, and 7 cfs downstream of D. Thus the stream is "fully appropriated" in the sense that no new consumptive user can divert upstream of either farmer.

Now suppose that for one reason or another (for instance, a federal subsidy, a regulatory requirement, or a mitigation banking effort), Farmer Hanson decides to undertake an extensive



irrigation efficiency improvement project. Let us suppose that by lining his ditches, converting to drip irrigation, or what have you, Farmer Hanson is able to significantly improve his efficiency and cut his diversions in half. Thus, after the efficiency improvements, Farmer Hanson only needs to divert 5 cfs to grow the same crop while consumptive use stays at 3 cfs. This would leave 8 cfs in the stretch between points A and B (compared to 3 cfs before the improvements).

Moving downstream, however, the water savings vanish. As Farmer Hanson reduced his diversion by 5 cfs, his return flow also was reduced by 5 cfs (from 7 to 2 cfs). Downstream of his return flow (between points B and C), the flow remains at 10 cfs, the same as it was before the costly efficiency measures were installed. And Farmer Rodriguez continues to divert all of it onto his crops.

Whether the efficiency improvements were a worthwhile investment depends upon whether the object was to improve flows within the depleted stretch upstream of the return flow (between points A and B) or downstream of the return flow. For instance, if an endangered snail lived between points A and B, the efficiency improvements could be of significant value in improving the habitat. If, on the other hand, the object of the improvements was to provide more water to flush endangered salmon through reservoirs somewhere downstream, the efficiency improvements may not have increased the total volume of downstream flow.

This example, of course, is highly simplified. It assumes (1) instantaneous return flows, (2) discrete, non-overlapping return flow points, (3) no conjunctive use of groundwater, (4) no change in consumptive use, (5) no storage of water, (6) no inter-basin transfers, and (7) no cumulative effects. Changing any of these assumptions might change entirely the outcome of the analysis.

First, in the real world, return flow is not instantaneous. The component of return flow which returns water to a river at the end of the irrigation system is close to instantaneous, but the component which returns via groundwater may involve considerable delays. To the extent that return flows are delayed, water conservation measures may result in temporary net inputs to the river until a new equilibrium is reached. This would occur as diversions are reduced, but recharge (from old diversions) continues for a period at the same rate. While the bonus is temporary, it might nevertheless be a critical component of a species recovery program.

> ***By better understanding the dynamics of water conservation and water re-use, we can better target investments in conservation to ensure the biggest return for increasingly scare dollars.***

Second, water which returns to the stream via groundwater return does not come in at a particular point (except in rare cases like Thousand Springs in Idaho) and may not return for long distances. Consequently, the area of improved flow resulting from efficiency improvements may be both less discrete and much larger than in the example above. Thus flows may be improved not just down to the next farm, but for hundreds of miles.

Third, the example above does not include a groundwater component. A more realistic example may be that Farmer Hanson's excessive diversion is not simply returning to the stream to be used by downstream diverters, but is recharging a large aquifer which is supplying down-gradient groundwater pumpers. If Farmer Hanson then implements irrigation improvements which reduce his diversion, there will be more water in the river and less water for the groundwater pumpers. Assuming the groundwater pumpers cannot prevent Farmer Hanson from reducing his diversion, they are the loser, and the river is the winner.

Fourth, the example in the figure above assumes no change in consumptive use. That is probably a fair assumption in most cases. Lining a ditch, for example, has little impact on evaporative loss and does not change the quantity of water lost to evapotranspiration. On the other hand, some conservation measures may change consumptive use. Where that happens, "real" savings are realized. For instance, if water is lost from a leaky ditch to a contaminated aquifer, lining the ditch puts "new" water back into the system. Switching from sprinkler to drip irrigation will reduce evaporation. And, of course, switching crops may produce huge changes in consumptive use.

Fifth, while the example above produced no change in the total volume of water below point B, the timing of flows may have changed due to a variety of real-world factors. In a particular situation, it may be that flows could be "shaped" to improve habitat or advance other goals. This ability to shape flows may be enhanced if the water not diverted may be put into storage (or may be left in storage).

Sixth, if the water savings occur on a trans-basin diversion (or involve crossing other hydrologic or legal barriers, such as state lines), the results may be substantially different from the example above. For instance, if Denver diverts water on the western slope of the Rockies but provides return flows to the Platte River system on the other side of the Continental

(**Deceive** continued on p. 13)

Agricultural Water Conservation & Balanced Allocations: Some Promising Programs

by Rita Haberman and Neil Schulman

The significance of agricultural water use must be acknowledged in comprehensive approaches to using water efficient technology as a strategy to protect rivers. Agriculture takes the lion's share of water for off-stream uses, roughly 70% of freshwater used in the United States (Laird, 1991). Western rivers in particular are impacted by irrigation. Western farmers irrigate with an estimated 85% of the annual water supply of 17 Western states.

Even though agricultural water use is estimated to be only 40% efficient (Vickers, 1991), and even small efficiency improvements in agriculture would free up water for other uses, change is slow to come. In *Overtapped Oasis*, Marc Reisner provides a good explanation why, "The prior appropriation doctrine mandates that water be applied to a 'beneficial' use or it is no longer considered appropriated. According to traditional water law doctrine, a farmer using water for irrigation is entitled to the quantity of water reasonably needed for the crops being grown. If the farmer is applying excess (unreasonable) amounts of water, this water is technically not part of the appropriative right. Thus if a farmer installs water-saving technology and reduces his water use, the excess water becomes available for other appropriators to use. Never having belonged to the farmer, it is not available for sale or transfer."

Too few states have passed statutes that provide water users with incentives to use water more efficiently. A few relatively new programs, however, show promise. A very important component of these programs is that they acknowledge the need not just to use water more efficiently but to transfer water from existing off-stream uses to instream purposes. If water conservation programs are designed to benefit rivers, they need to link incentives for water efficiency with measures to reallocate water to the environment. Although agricultural water conservation and allocation programs are in their infancy, three programs — Central Valley Project Improvement Act, Washington's Trust Water Rights Program and Oregon's Water Conservation Statute — are well worth describing.

Central Valley Project, CA

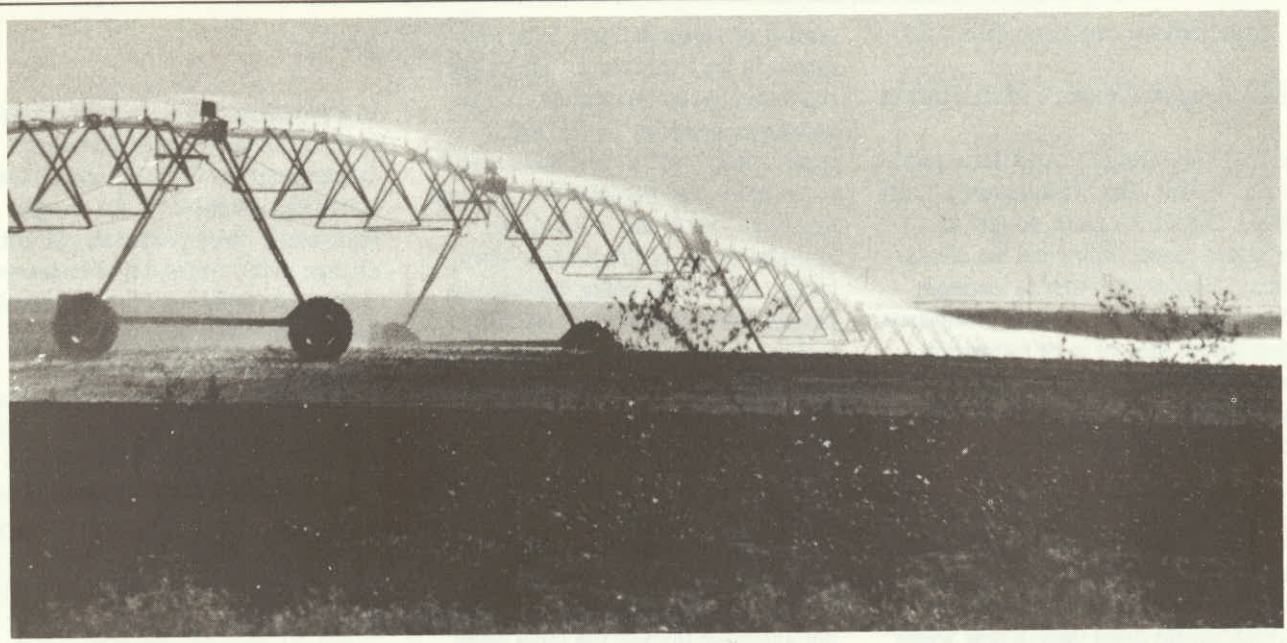
The Central Valley Project (CVP), one of the largest irrigation projects in the Western world, has had a devastating impact on salmon, waterfowl and other wildlife populations in California (Reisner, 1990). Much of the damage is irreparable, but some beneficial changes are likely as a result of the Central Valley Project Improvement Act (H.R. 429) that Congress passed in fall 1992. According to Karen Garrison of Natural Resources Defense Council, "The passage of the Act is a resounding endorsement for a whole new direction for western water management. For the first time on this scale, Congress has embraced the idea that an existing project must encourage efficiency and environmental balance. Congress has also affirmed that a federal water project should help meet the diverse beneficial water needs of a state rather than reserving water for agriculture despite the cost."

The Act sets four key precedents for California and the West. First, the Act designates fish and wildlife as an official purpose of the CVP and sets up a fund for water purchases for the environment. In the past, the Bureau of Reclamation used the lack of such a designation as a justification for maintaining traditional uses such as irrigation, regardless of their efficiency level, at the expense of fish and wildlife. Second, the Bureau is required to prepare a programmatic environmental impact statement on renewal of all the long-term CVP contracts. The EIS could be a tremendously useful tool for analyzing a host of issues that are central to western water reform such as water allocation alternatives and pricing policies. Third, the Act permits the transfer of water by individuals and districts in the CVP to urban purveyors or environmental interests. While the transfer provision will generally benefit the environment by reducing urban pressures for further water development, concerns remain about its potential to promote urban sprawl. And fourth, the Act uses a combination of incentives and assistance to encourage conservation, including tiered pricing, funding for on-farm conservation, and reallocation of a portion of the CVP supply. The exact impacts of the reform of the CVP won't be known for years, but it certainly represents a gain for environmental interests.

For more information about the CVP Improvement Act, contact Karen Garrison, NRDC, 71 Stevenson, Suite 1825, San Francisco, CA 94105.

Washington's Trust Water Rights Program

In 1989 and 1991 the Washington



State Legislature established the Trust Water Rights Program, which allows for the transfer of conserved or donated water to new uses, including instream rights. Although the program has yet to be implemented statewide, it could work to increase water conservation and to, in the words of the Legislature, "provide for presently unmet and emerging needs."

The Trust Water Rights Program allows the Washington Department of Ecology to acquire water rights, including rights to conserved water, either temporarily or permanently, by sale, lease or donation, from a current holder of a valid water right. The Department of Ecology can then use the trust water for either instream or off-stream uses, with the priority date of the original water right intact. The transfer to Trust water rights need not be the entire amount of the original water right.

The Trust Water Rights program could provide incentives for increasing water-use efficiency that currently do not exist under Washington's prior-appropriations doctrine of water use. For example, suppose a farmer holds a water right to irrigate 100 acres of cropland, and by modernizing his irrigation system he could increase efficiency by 30%. Under Washington's prior-appropriations doctrine, he is prohibited from using this saved water for any other use, such as irrigating another 30 acres of crops; he would be required to return it to the stream. Therefore, there is no incentive for the farmer to use water more efficiently; in fact, he stands to lose money from the cost of implementing conservation measures.

Under Trust Water Rights, however, the farmer could transfer (sell, lease or donate) all or some of his conserved water to the state, to be applied to other needs or to instream flow rights, with the same priority date as the original water right, while using the remainder on his land. In addition, as Lorri Bodi of American Rivers' Northwest Office points out, Trust Water Rights also provides an opportunity for third parties, such as river advocacy groups, to play a role in promoting efficient water use by helping finance efficiency measures in return for a certain amount of the conserved water being donated to the Washington Department of Ecology as an instream flow right. (Under Washington law, only the Department of Ecology can hold and instream right.) In addition, a farmer retiring from agriculture could use the Trust Water Rights program to dedicate his water right to an instream right (and get money for it) instead of having his right considered abandoned, and that water made available to other consumptive users. Short-term leases during dry periods could also provide water users with greater flexibility than selling or donating water rights.

The Trust Water Rights program is currently operating as a pilot project on three rivers, with the possibility of expansion to eight other rivers and then statewide. As yet, no transfers of water rights have taken place. There are two main obstacles to the program: the lack of funding and the difficulty of technically administering water transfers. Yet despite these difficulties, the program has the potential to add water conservation incentives into a water allocation system where these incentives do not currently exist, and to allocate some or all of the conserved water to instream flow rights in the process.

For more information on the Trust Water Rights Program, contact Lorri Bodi at the Northwest Office of American Rivers, 4518 University Way NE, Seattle, WA 98201, (206) 545-7133, or Cynthia Nelson, Washington Department of Ecology, P.O. Box 47600, Baran Hall, Olympia, WA, 98504-7600, (206) 459-6116

(**Agriculture** continued on p.12)

(**Agriculture** continued from p.11)

The Oregon Conservation Statute

In 1987, the Oregon Legislature passed a statute that, like Washington's Trust Water Rights Program, sought to promote conservation and the allocation of conserved water to instream flow rights. While Oregon's conservation statute has yet to be successful, with a few changes in the statute, it may yet provide a model for future conservation programs.

Under the current program, holders of consumptive water rights who implement water efficiency projects can apply to the conservation program, which would grant them a new water right for 75% of the saved water, with the remaining 25% going to an instream flow right administered by the Oregon Water Resources Department. Both new rights are given priority dates of one minute after the original appropriative right. The appropriator may then use, sell, or lease their portion of the saved water.

Several difficulties with the legislation have restricted the usefulness of the program, and thus far, only two applications have been received, neither of which is likely to be completed in the near future. The largest roadblock is that the statute defines conserved water as "water that is irretrievably lost" to processes such as evaporation and percolation into deep aquifers. While this criteria was included in the bill to protect downstream users from being damaged by having water that would ordinarily make its way back into the stream as return flow appropriated under the conserved water right, it has greatly reduced the amount of water available under the program, and therefore the incentive for appropriators to install conservation measures. Another difficulty with the program is the need for data on water use, much of which is not available in even the most basic form. "There's a lot of very simple information we just don't know," says Karen Russell of WaterWatch of Oregon, a conservation group working to protect the state's water resources, "For example, we often don't know how much water people are using so it is difficult to know how much water is being saved." The amount of time necessary for an application to be reviewed and the uncertainty of how much water the user will be granted have also deterred water users from making investments in water conservation.

In attempting to improve the program, both the Oregon Water Resources Department and WaterWatch have submitted proposals to the Oregon legislature. Both proposals call for a change in the definition of conserved water from water that is "irretrievably lost" to the difference between the amount of water certified by the original water right and the amount now needed to fulfill the purpose of the right. Under the WaterWatch proposal, however, 50% of the conserved water goes to the user, with the other half going to an instream right. Because more water will be available for the program due to the broader definition of conserved water, WaterWatch believes this ratio will provide enough water for users to help realize their investment, and also direct larger amounts of water toward instream flow rights. The Department's proposal retains the 75%/25% ratio. The WaterWatch bill also includes a process for resolving disputes so that protested applications don't just sit indefinitely.

For more information about the Oregon Conservation Statute and proposed amendments, contact Karen Russell, WaterWatch of Oregon, 921 S.W. Morrison, Suite 438, Portland, OR, 97205, (503) 295-4039, or Becky Kreag, Oregon Water Resources Department, 3850 Portland Road N.E., Salem, OR, 97310, (503) 378-3671.

References Cited:

Laird. 1991. *Water-Efficient Technologies: A Catalog for the Residential/ Light Commercial Sector*. Second edition. Rocky Mountain Institute. Snowmass, CO.

Reisner. 1990. *Overtapped Oasis: Reform or Revolution for Western Water*. Island Press, Covelo, CA.

Vickers. 1991. Building toward sustainable water supplies in the 21st century in *West Meets East*. Scenic Hudson, Poughkeepsie, NY.

Feedback for Farmers: The Missing Link

Even though agricultural water use is mired in a long history of laws and regulations, and innovative programs calling for change are rare and slow in coming, there are many possible ways to facilitate efficient and appropriate use of water in agriculture.

Rocky Mountain Institute has developed some valuable information about what is needed to foster the adoption of more efficient irrigation practices on the farm. Effective technology and techniques exist — monitoring soil-moisture levels in crop-root zones using gypsum blocks (electronic sensors), replacing unlined irrigation ditches, switching to drip irrigation systems, and numerous others. What is often missing, however, is providing farmers with the right information in the right manner at the right time, in the form of feedback.

Of course, the key consideration for farmers and water managers is cost, so providing them with information about the real cost of water use is essential. They need information not only on the cost of water itself, but of energy, materials, maintenance, and labor required for using that water. The information should also include environmental costs and what it costs to clean up polluted drainage water. Other types of helpful feedback are information about how much water is actually being used and how much irrigation water a given crop really needs.

For more information about the types of feedback, implementation techniques, the manner in which information is fed back, and case studies, refer to a paper by RMI, "Feedback and Irrigation Efficiency." (see References on p.16)

(**Deceive** continued from p.9)

Divide, municipal water conservation (if it actually lead to reduced diversions) would increase flows on the Western Slope while reducing flows in the Platte.

Seventh, the example above focuses on conservation measures adopted only by a single farmer. Perhaps a more meaningful scenario would involve water conservation adopted throughout a basin. If that were the case, the incremental savings between points A and B could be replicated over a large area.

In short, while water conservation is an important goal, it is not as simple as screwing in a lower watt bulb. A gallon saved is not necessarily a gallon earned. Whether habitat is improved as a result of efficiency improvements is highly situation specific, a fact sometimes not fully appreciated by advocates for efficiency improvements. By better understanding the dynamics of water conservation and water re-use, we can better target investments in conservation to ensure the biggest return for increasingly scare dollars.

This article is reproduced with permission from a soon-to-be-published book entitled, "Handbook on Idaho Water Law: An Introduction for the Layperson and Guide for the Practitioner". This section of the book was written by Christopher H. Meyer, a partner in the firm Givens Pursley and Huntley in Boise, Idaho. Mr. Meyer welcomes feedback on this piece, and, in particular, anecdotes documenting or refuting the observations made. Send your comments, or requests for information about the book, to: Chistopher H. Meyer, Givens Pursley & Huntley, 277 North Sixth Street, Suite 200, Boise, ID 83702, (208) 387-1202.

Helping Farmers Use Less Water

One example of the potential to improve inefficient agricultural irrigation practices comes from the Broadview Water District in California. The District gave farmers feedback through a pricing structure that points out the environmental costs of inefficient irrigation. As a result, the district saw farmers use 17% less water per irrigated acre and reduce drainwater volumes by almost 25%. The decreased drainwater volumes means less salt and selenium laden discharge, a problem in the region exacerbated by irrigation, goes into the San Joaquin River.

Source:
Rocky Mountain Institute, 1992

(**Efficiency** continued from p.3)

management schemes and lifestyles. Time for Seattle to ponder the fate of the North Fork Tolt, for California to build win-win coalitions between farmers and city-dwellers, and for Phoenix to rethink its landscaping habits.

An Economic Development Bargain

Water efficiency programs, at their worst, allow business as usual. At their best, they allow long-term planning and spark needed economic renewal. New businesses can spring from the streets, just like the new water supplies.

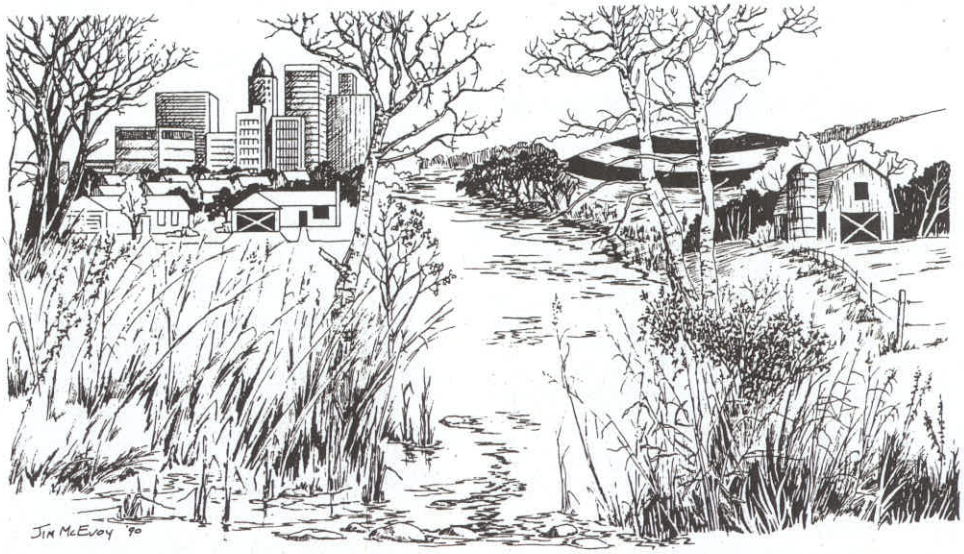
Businesspeople such as Tom Horner, of Alexandria, Virginia, install and maintain water-efficient technologies in schools, hotels, and apartments. His business, Water Management Inc., is a water service company, or WASCO, that asks for no upfront money, taking as payment a fraction of the measured water savings. If an apartment complex saves $100 a month, $50 may go to Water Management and $50 stays with the apartment owner. Water Management Inc. has serviced 120,000 units since 1980 and now employs over 30 people. As WASCOs create jobs and strengthen the local economy, they prove that economic development can be driven by a commitment to a healthy environment.

Water efficiency offers many rewards: providing a cheap new source to the water utility, energy supplies to gas and electric utilities, economic development and jobs to the community, protection and enhancement to the local environment, conflict resolution to competing groups, and time to plan a sustainable future.

Less needed will be dams and expensive high-tech schemes to drag arctic icebergs. That is because the best new supplies of water -- ones that will save money, energy, ecosystems, and conflict -- will be gathered by choosing the best buys first and tapping the bountiful rivers of savings from water efficiency.

Andrew Jones is a research associate and Jim Dyer is the director of the Water and Agriculture Programs at Rocky Mountain Institute, a nonprofit resource policy foundation founded by Amory and Hunter Lovins.

This article first appeared in Calypso Log, February 1993 (a publication of The Cousteau Society) and is reprinted (with minor changes) with permission.



(**Dams** contined from p. 5)

foreseeable future. Using more realistic projections, they predicted that water available in Birmingham in the year 2025 will be double that which is needed, even without the reservoir. They argued that the debate over the proposed dam should end here but went on to show there are numerous alternatives to the dam.

The coalition's analysis of alternatives was also quite impressive exploring demand-side management. The CRS emphasizes the concept of "demand side" management based on the principle that it is generally cheaper and more environmentally sound to reduce demand than to increase supply. They recommend numerous ways for the BWW to reduce per capita water consumption beginning with conducting a comprehensive study of water use in Birmingham, taking that information to conduct a cost/benefit analysis of a water efficiency program, and implementing a pilot retrofit program.

The Coalition promotes water efficiency as by far the best way to "supply" additional water, if and when it is ever needed, but they also identified some nonstructural and structural alternatives if new raw water supplies were urgently needed. Some of these alternatives, with far less cost and environmental impact, include diverting water from an existing nearby multipurpose reservoir, sustainable use of groundwater supplies, and raising the level of an existing reservoir.

The coalition has recommended a long term comprehensive approach to protecting and managing existing water supplies. This approach includes protecting existing supplies, efficient water use, beneficial reuse of wastewater, and if and when the acquisition of more raw water ever actually becomes necessary, the adoption of one or more of the several less environmentally damaging and far more cost-effective alternatives to the Locust Fork project.

Don Elder offered some advice to other river advocates fighting proposals for new water supply dams. First, contact the Rocky Mountain Institute and the Cahaba River Society. Ask for information and read it. Second, become familiar with the regulatory process. "It can be daunting, but most of it boils down to assessing need, alternatives, and impacts," says Elder. "We are bound and determined to make sure the BWW goes through these three hoops, and that they go through them in the proper order." Third, collect data on water use in your area. Try local planning departments, state water resource agencies, and water utilities. Fourth, recognize that the potential scope of alternatives is expansive. Inform water planners of options and hold them accountable to consider and explore alternatives. Fifth, educate decision-makers about these cost-effective, less damaging solutions. The coalition has distributed their well written, thorough position paper not only to the BWW but also to key local politicians, state and federal regulatory officials and others whose decisions about the proposed dam will be important. Sixth, build a coalition. Make it broad. "It's not only an environmental issue, it's a social justice issue," explains Elder. Unnecessary, expensive structural water projects mean higher water bills for everybody and a burden felt most by lower income people.

According to Elder, the biggest opposition to non-structural alternatives is the pervasive bias on the part of engineers to solve water supply issues with big structural solutions. That's what they were trained to do and have been doing for decades. In addition to biased engineers in public water agencies, there are also biased engineers in consulting firms motivated by big money for big projects. Elder and the coalition have dealt with biased engineers by questioning their assumptions, predictions, and hypotheticals and focusing arguments on what is known for certain. They argue that water efficient technologies are cost-effective and work, so why are we still opting to build large, expensive structural projects with major adverse environmental impacts.

> ***"The regulatory process can be daunting, but most of it boils down to assessing need, alternatives, and impacts. We are bound and determined to make sure the Birmingham Water Works goes through these three hoops, and that they go through them in the proper order."***
>
> Don Elder,
> Coalition for a Free-flowing
> Locust Fork River

To date, the BWW has not yet applied for a Clean Water Act Section 404 permit (dredge and fill) required to build the dam, and they've made a commitment to make water efficiency a part of its ongoing "source of supply" studies. Meanwhile the CRS and the coalition is using this time to build an even stronger case with more alternatives.

For more information about the Two Forks fight contact EDF , Rocky Mountain Region, 1405 Arapahoe Ave., Boulder, CO 80302. For more information about the Locust Fork fight, contact Cahaba River Society, 2717 Seventh Ave. S., Suite 205, Birmingham, AL 35233.

Reference cited:
Coyle, K and C. Brown. 1992. *Conserving Rivers: A Handbook for State Action.* National Park Service and American Rivers, Inc.

References on Water Conservation & Efficiency

Rocky Mountain Institute's Water Efficiency Resources

All of the following are available from Rocky Mountain Institute, 1739 Snowmass Road, Snowmass, CO 81654-9199, (303) 927-3851

Water Efficient Technologies: A Catalog for the Residential/Light Commercial Sector — Second Edition. Contains 136 product listings of state-of-the-art high-efficiency toilets, showerheads, faucet aerators, outdoor water equipment, and appliances. (pub #W91-18) $25.

Water Efficiency: A Resource for Utility Managers, Community Planners, and Other Decision makers. Describes in detail the economics, technology, and implementation techniques of successful water efficiency programs. (pub #W91-27) $15

Water Efficiency for Your Home: Products and Advice Which Save Water, Energy and Money. (pub #W91-26) $1.

Water Service Companies. Outlines the latest in environmental entrepreneuring: savvy companies that install water efficient equipment for free and take their payment as a percentage of the water savings. (pub #W92-12) $3.

Water and Energy Utility Partnerships. Describes how water and energy utilities are working together to promote residential water efficiency. (pub #W92-13). $3.

Feedback and Irrigation Efficiency. Concepts and case studies showing how getting the right information to farmers at the right time results in more efficient irrigation. (pub #A92-20) $6.

Water Conservation Catalog by CA Department of Water Resources (1993). Lists publications, computer programs, and audio/visual presentation available for use to develop your own water conservation programs. Materials described in the catalog are free and not copyrighted. Contact CA-DWR, Division of Local Assistance, Attn: Bulletins & Reports, PO Box 942836, Sacramento, CA 94236-0001, (916) 653-1097.

Water: Conservation and Reclamation by The Global Cities Project's Building Sustainable Communities: An Environmental Guide for Local Government (1990). Provides helpful background and step-by-step information about designing and implementing a wide variety of water-saving programs. In addition, they are developing in-depth case studies on several water-saving programs. Available from The Global Cities Project, 2962 Fillmore Street, San Francisco, CA 94123, (415) 775-0791. $20.

No Water to Spare: A Challenge for New England's Future by Conservation Law Foundation (1993). Includes information and three case studies about water supplies, emphasizing demand management and efficiency improvements. Available from CLF, 62 Sumner Street, Boston, MA 02110, (617) 350-0990. $12.95 (discount for members of CLF).

Conservation Works: The Ecological and Economic Benefits of Conserving Water by Judith Wagner and Russ Cohen. (1990). Available from Massachusetts Riverways Program, 100 Cambridge Street, Rm. 1901, Boston, MA 02202.

West Meets East: A Resource Book on Water Saving Strategies for the 21st Century by Scenic Hudson (1991) Proceedings conference hosted by Scenic Hudson that provides information on the rational and benefits of water use efficiency as a management and planning tool. Also includes a long reference list. Available from Scenic Hudson, 9 Vassar Street, Poughkeepsie, NY 12601, (914) 473-4440. $7.50.

Conserving Water: The Untapped Alternative. by Sandra Postel (1985). *Worldwatch paper 67*, Worldwatch Institute, 1776 Massachusetts Ave., NW, Washington, DC 20036.

Water for Agriculture: Facing The Limits by Sandra Postel (1989). *Worldwatch paper 93*, address above.

Water Conservation News, a free quarterly publication providing some of the latest information on urban and agricultural water conservation developments. Contact: CA Dept. of Water Resources, PO Box 942836, Sacramento, CA 94236-0001, (916) 327-1653, Attn: Alice Dyer, Editor.

California Department of Water Resources (CDRW) - Division of Local Assistance, Conservation Office, PO Box 942836, Sacramento, CA 94236-0001, (916) 653-5928. CDRW's Conservation Office has staff experts in numerous aspects of water conservation.

"Questions to Ask About Water Projects: A Guide for Those Who Wish More Information About Proposed Water Resources Development Projects," by Gerald Meral (1986). Available from Planning and Conservation League Foundation, 926 J Street, Suite 612, Sacramento, CA 95814, (916) 444-8726. $4

Letter to the Network

Wetlands: An Alternative Technique to Treat Acid Mine Drainage

Dear Friends of Rivers:

A few weeks back we had a rare sunny day in this Western Pennsylvania winter. Even more unusual, the temperature rose to the mid sixties, and just by lucky chance, I was out with a group of people taking samples from Mill Creek, a tributary of the Clarion River. My companions were members of the Mill Creek Coalition, a group working to bring the stream back from the brink of biological destruction caused by the acid drainage left from a century of intensive strip mining for coal and drilling for gas and oil.

Although segments of the stream appear pristine, deadly acid mine drainage discharges of up to 50 gallons per minute flow directly into the stream at numerous points, dumping vast quantities of iron and acidity into the creek system. Most of the sites discharging acid mine drainage in the area were long ago abandoned and there is little or no hope of finding a responsible party to repair the damage. Conventional treatment, which usually involves releasing caustic soda into a discharge, provides the chemical conditions necessary to raise the pH and deposit the iron precipitate into channels or ponds. Then the treated water can be released into the stream. This method is costly and requires constant management of the equipment involved.

The Mill Creek Coalition set out to create a wetlands treatment system constructed with donated labor, equipment and materials and designed so that the materials used would provide effective, economical and long-term treatment. A discharge is captured in a pipe, channeled into an anoxic pit filled with tons of limestone. The acidic water dissolves the limestone in the absence of oxygen, and then it is aerated which causes the iron to fall out of a solution in a series of channels or ponds. The garish orange color of the rocks and sediments tinted by oxidized iron provides startling evidence of the success of the ponds. The water eventually drains into a holding pond lined with limestone and compost to increase the pH. Sample testing from the pond outflow shows that pH has been improved from readings of 3 and 4 to 6 or 7, and that iron is being reduced by 70 to 90 percent.

The Mill Creek Coalition was formed two and a half years ago by an informal group of acquaintances who all have an interest in the health of the watershed. Members include outdoor sports enthusiasts, university biology professors, Trout Unlimited and Audubon members, local environmental consultants, Soil Conservation Service staff, and the League of Women Voters. The National Guard has provided a major contribution of heavy equipment and labor, and Trout Unlimited and other private sources have provided the roughly $35,000 spent in cash on the three sites treated so far. The Coalition is working with state officials in a variety of ways to expand their work and further protect the watershed.

The Coalition is now planning to focus their work this summer on Little Miami Creek, a major tributary. Preliminary sampling indicates that this tributary is in worse condition than Mill Creek and will offer an even greater challenge to the group. They have begun applying for some more sizeable grants and in time they hope to improve water quality enough so that the native fisheries can be reestablished. While the treatment does not reduce all acid drainage to meet the state standards now applied to the mining industry, the Coalition's work does demonstrate the effectiveness of less costly methods for "orphan" sites which would otherwise receive no treatment. Ultimately this project will benefit the Clarion River, which is a water source for several municipalities, and the overall Allegheny River system.

Judith Wagner

For more information about the work of the Mill Creek Coalition contact Judith Wagner at 427 Ridgewood Road, Shippenville, PA 16254.

Send Letters to the Network to:

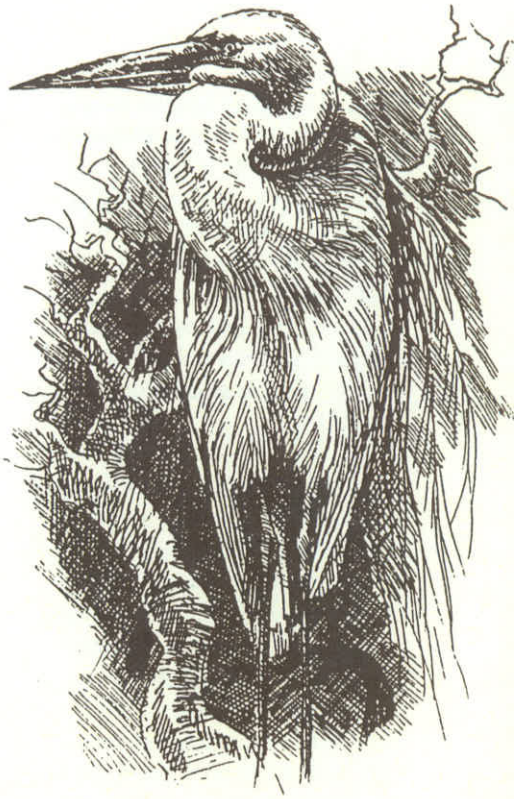
River Network
Attn.: *River Voices* editor
PO Box 8787
Portland, OR 97207

River Leadership — 4 New State Groups

River Network's River Leadership Program is thriving and growing rapidly with ongoing projects in 15 states during 1993. River Network has played key parts in the formation of four new statewide river protection organizations since October: the Rivers Alliance of Connecticut (and Rivers Alliance Action, a 501 (c) (4) organization), New York Rivers United, the Kentucky Rivers Alliance, and the Alliance For Pennsylvania Watersheds. New opportunities keep arising with initial organizing and other activity in Wisconsin, New Mexico, Alabama, Montana, and Minnesota. The New Hampshire Rivers Campaign is also working with River Network to broaden its activities in N.H. and become a free-standing, permanent organization.

No one organization or individual can do all this work alone. Much of the success for the creation of the new state organizations relies upon cooperative efforts among many regional and national groups along with River Network and the individual leaders of the new state river protection organizations. American Rivers, through the tireless organizing of Suzie Wilkins, laid the groundwork for the new groups in Connecticut (Sarah Leff, Executive Director of the Rivers Alliance of Connecticut) and Kentucky (Beth Stewart of the Kentucky Community Rivers Alliance), and provided major support in Pennsylvania, New York and nearly every other current state project. The American Whitewater Affiliation (Pete Skinner and Rich Bowers) played the key role in New York helping Bruce Carpenter get underway with New York Rivers United. Pennsylvania's effort is dependent on the start-up and continuing incubation efforts led by Jan Jarrett of the Chesapeake Bay Foundation, and the Montana Wildlife Federation continues efforts with River Network and others to start a free-standing Montana Rivers Council.

Thanks to the many-splendored efforts of all of these groups, and many others, River Network has been able to join with the different efforts to create, strengthen and broaden new statewide river protection organizations. We are always on the lookout for opportunities to support new statewide organizing efforts. If you, or someone or some group you know has a burning desire to organize broadly based new statewide river protection organizations, contact River Leadership Program Director Pete Lavigne at (503) 241-3506 or send a message on Econet to "rivernet".



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River Network: Working on National River Policy Issues

The River Leadership Program also plays an active role in enhancing communications and helping to coordinate efforts on new national river and water policy legislation. River Network participated in a meeting in February with Representative George Miller of California (Chair of the House Natural Resources Committee) to discuss Representative Miller's proposed Urban Rivers Restoration legislation. River Network recently started working with the Pacific Rivers Council to build a consensus among river organizations and other groups on a "National Watershed Registry" bill for private lands river protection, and River Network actively works with the 400+ organization Clean Water Network on its efforts to strengthen and reauthorize the federal Clean Water Act currently before Congress. Watch for news on these and other River Leadership Program activities in the next issue of *River Voices*.

River Network's River Clearinghouse Services

Toll-free problem solving service:
1-800-423-6747: Call us and we'll give you whatever help we can to save your river.

Networking:
We maintain a database of over 2,000 grassroots river conservation organizations. Tell us what you are working on and we'll put you in touch with other activists and organizations who can share their experience with you.

Lotus Software:
In cooperation with the Lotus Development Corporation, River Network is offering a free copy of Lotus 123 software to any organization working on river protection. Lotus 123 is both a spreadsheet and a database software program compatible with personal computers. If your group is interested, please send River Network a letter that includes the following information:
1) a statement that your group is incorporated
2) a brief description of how your group plans to use the Lotus software, and
3) what size computer disks (3.5 or 5.25 inch).

Special Publications:
River Wealth a collection of fundraising ideas and techniques used successfully by grassroots river groups. Ideas are organized by membership, business support, events, and sales and services. $5.00

River Wise a collection of public education techniques used successfully by grassroots river groups to educate their communties about the values and issues of their local rivers. $5.00

C(3) or C(4) - a manual to lead river groups through the decision-making process of whether to apply as 501(c)(3) or 501(c)(4) tax-exempt status. $2.00

Case studies:
We document and distribute "success stories" of river conservation to help activists avoid reinventing the wheel. We recently published a booklet of five case studies, entitled ***People Protecting Rivers: A Collection of Lessons from Grassroots Activists.*** The features stories are the Charles in Massachusetts, Clark Fork in Montana and Idaho, Gauley in West Virginia, Sacramento in California, and Upper Mississippi in Minnesota. The case studies are organized by issues for easy reference. $2.00

Fundraising Training Videos:
If your group is considering a fundraising campaign, you may want to consider some training first. Kim Klein, a national fundraising trainer and author of *Fundraising for Social Change*, with help from the Partnership for Democracy, has produced six videos:

Planning for Fundraising
Special Events
The Role of the Board
Asking for Money & Prospect Identification
Major Gift Solicitation
Raising Money by Mail

River Network has purchased a set of these videos. If you'd like to borrow them, free of charge, give us a call.

DORIS
Directory Of River Information Specialists

DORIS is a free service to put you in touch with volunteer specialists with expertise on river-related issues. River Network has recruited over 500 river specialists within conservation organizations, professional societies, state and federal agencies, and our national network of river guardians. DORIS specialists have expertise in a wide variety of issues ranging from hydropower to streamside development to pollution. Information about the DORIS specialists, including how they'd like to help grassroots river activists and areas of expertise is compiled on a computer database housed at River Network.

To find out more information about DORIS and how it can help you and your group protect rivers, call us toll-free at (800) 42-DORIS. We'll link you up with some free advice.

We'd like your input to make DORIS even better. We are always interested in expanding the team of DORIS specialists. If you have experience or expertise in any aspect of river conservation that you feel would be helpful to other river activists, we welcome and encourage you to participate in DORIS. In addition, if you know of other river specialists you think might be interested in sharing their expertise through DORIS, please let us know who they are. We will contact them through the mail and request their participation.

National Survey of River Advocates

If you haven't returned your River Advocate Questionnaire, it's not too late. We'd like your input as we continue to develop River Network's programs and services. As an incentive and a thank-you for your time, we'll send you a free copy of *River Wise*, a collection of public education ideas. If you's like another copy or never received the questionnaire, please give us a call (800) 423-6747.

Many thanks to the hundreds of river activists who have sent us their questionnaires and information about their programs. We are compiling and analyzing the results which we will report in a future issue of *River Voices*.

Yes, I'd like to support the work of River Network. Enclosed is my donation:

__$35 Supporter __$100 Contributor __$1000 Founder

Name:_____

Address:_____

City, State, Zip:_____

Telephone:_____

Yes, I know of a river guardian or group that may be interested in becoming part of the national Network. Please send information to:

Name:_____

Organization:_____

Address:_____

City, State, Zip:_____

Telephone:_____

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