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River Voices

Water & Energy

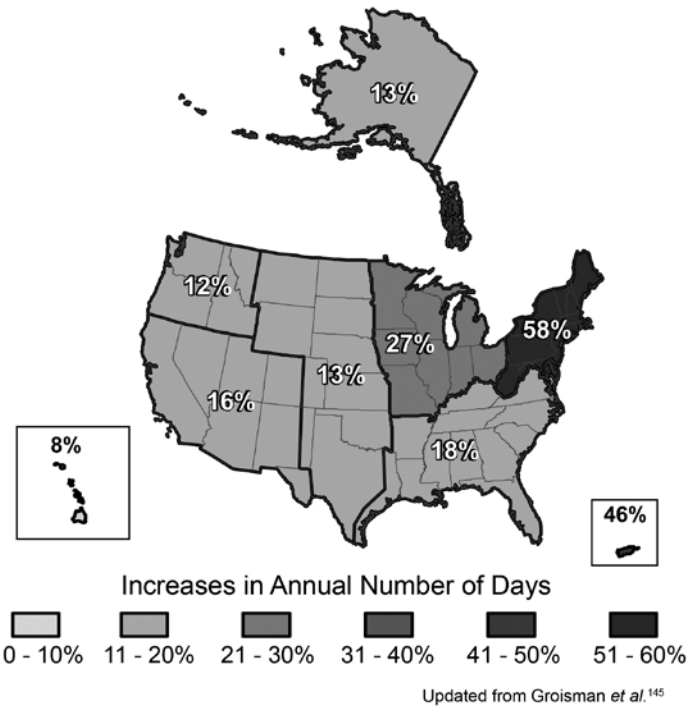
Sustaining Rivers in a Warming World

By Wendy Wilson, River Network, www.rivernetwork.org

Rivers across the world face significant new threats. In the September 30, 2010 issue of *Nature*, "Rivers in Crisis" (Vol. 427), leading scientists explain that freshwater ecosystems are the most threatened ecosystems on the globe. One reason is climate change. The world is getting warmer, and rivers are flooding more often. In the U.S., the incidence of heaviest precipitation events (the top 1%) has increased—on average by 20%—in fifty years, so that wherever you live, the weather is getting stormier.[1]

The other major reason is people. More people are paving more of the globe and using more and more resources. As this *River Voices* goes to press, the control structures in the Atchafalaya Basin in the lower Mississippi are wide open. In 1984, John McPhee described in *The New Yorker* how the effects of the 1973 Mississippi flood were worse than those of the larger rain event in 1927 because "every shopping center, every drainage improvement, every square foot of new pavements in nearly one half of the U.S. was accelerating runoff towards Louisiana." Since then, the paving of America has clearly continued, bringing us less security from floods.

Increases in Heavy Precipitation



Updated from Groisman *et al.*[145]

The map shows the percentage increases in the average number of days with very heavy precipitation (defined as the heaviest 1 percent of all events) from 1958 to 2007 for each region. There are clear trends toward more very heavy precipitation days for the nation as a whole, and particularly in the Northeast and Midwest.
Source: U.S. Global Change Research Program (www.globalchange.gov)

The Water & Energy Nexus

The complex relationship between water and energy creates more uncertainty about the future. Spiraling greenhouse gas emissions are related to our increasing water demands and vice versa. Just when we should be working to conserve both resources, we see enormous pressures to increase the use of each.

Water, and the water-related impacts of electrical production, is the first part of this relationship. In the U.S., the amount of water used to generate electricity is far greater than simply the amount of water that we use in our homes. A recent USGS report shows that 49% of all water diversions and 53% of fresh surface water withdrawals are used directly for the production of electricity. In comparison, domestic water supplies account for only 12% of total water use. On average, every kilowatt hour of electricity generated has a water-footprint of approximately 2 gallons of water.

[1] *Carbon Footprint of Water*, River Network 2009

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River Network

Connecting People, Saving Rivers

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River Network is a national, nonprofit organization whose mission is to empower and unite people and communities to protect and restore rivers and other waters that sustain the health of our country.

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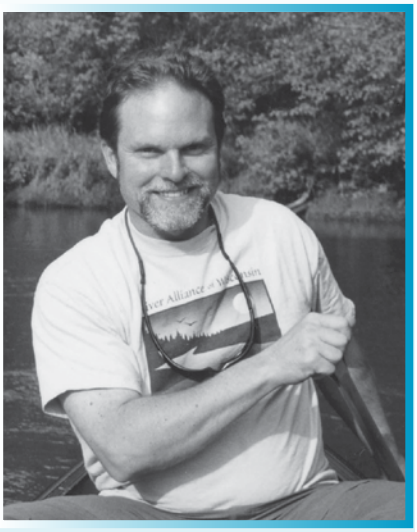
FROM THE PRESIDENT



River Network Photo Collection

Dear Friends,

That world renowned American philosopher Steven Colbert once said, "If we are 70% water, why am I only 2% interested?"

Those of us in the river and watershed movement understand this wry, tongue-in-cheek observation. Without fresh water, we literally do not survive. And yet, sometimes we humans are difficult to engage when it comes to protecting this precious resource. Now we are embarking on an effort to "get people interested" in how we use water for human uses by highlighting the dramatic intersection between water use and energy use, what we call the water-energy nexus.

This issue of *River Voices* explores how River Network is working with Partner groups from around the country to launch a campaign to address perhaps the most significant conservation crisis that we have faced on this planet: climate change. As I have said before, this campaign is not our campaign, but yours. We secured funding, engaged in a more than a year planning process with dozens of local, state and national partner groups and built this Campaign for all of us to use because many of you asked, "What can we do as a movement to reduce the effects of climate change?" If we are successful, then maybe, just maybe, we might put a dent in the rise in greenhouse gases that are fueling our impending climate catastrophe. We hope to do that by teaching people that in simple terms, every drop of water saved in the U.S. saves energy, and every unit of energy saved saves water.

Water is the heaviest thing that we move with energy. Because of that, how we use water for energy has an enormous impact on energy produced carbon emissions and resulting greenhouse gases. So every 8 pound gallon of water that we don't have to move is a very good thing for the planet—not to mention what that means when we keep that water in our rivers. In addition, the choices that we have to make as a society to conserve water are many. In this issue we outline how individuals, local partner groups and state and national organizations can all play a role in this exciting opportunity to begin to reverse some of the human causes of climate change.

So take a look inside, get informed and then join us as part of this collaborative Campaign to Sustain Water & Energy. Let's get the whole country interested, energized and engaged in this important work.

Yours in river conservation,

Todd Ambs, President
River Network

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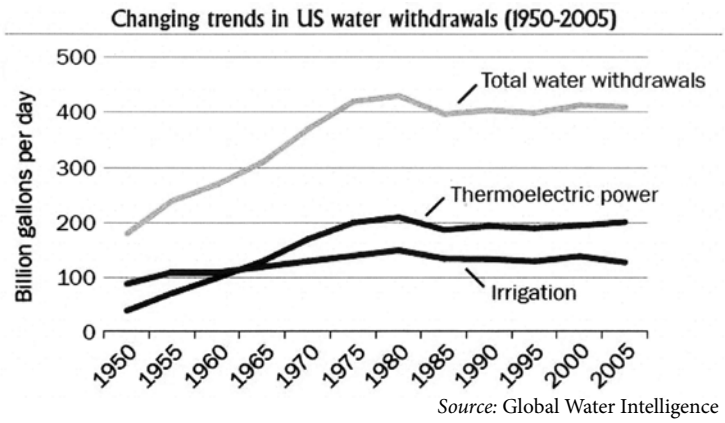
The other part of this relationship is the energy needed to heat, treat and pump our water supplies. Our nation's public water supply and treatment plants directly use over 3% of our electrical energy. River Network's *Carbon Footprint of Energy* report concludes that water-related energy use in the U.S. amounts to at least 13% of our annual electrical production[2] including commercial and residential water heating. If other water-related end use inputs such as commercial and residential dishwashers and water cooling systems are considered, the percentage is even higher.



Source: Global Water Intelligence

According to a recent Congressional Research Service report, this relationship is tenuous at best: "Major energy trends are pushing the energy sector to become more dependent on, and therefore vulnerable to, freshwater availability. This is occurring at a time of increasing concerns about the adequacy and reliability of freshwater supplies due to population growth and climate change."[3] Biofuels and some renewable fuel sources such as corn ethanol, algae, natural gas and hydropower also have high water needs. The demands of the energy sector are so high that adopting strong renewable energy standards, (promoting photovoltaic solar and wind generation) could conserve more water than all other water conservation policies combined.

Energy Intensities of Water Use Systems[4]

Water Use Cycle Segments	Range of Energy Intensity (kWh/MG)	
	Low	High
Water Supply & Conveyance	0	14,000
Water Treatment	100	16,000
Water Distribution	250	1,200
Wastewater Collection & Treatment	700	4,600
Wastewater Discharge	0	400
Total:	**1,050**	**36,200**

The energy needed to produce a gallon of water for public supply is rising as well. Most "new sources" of water require building longer pipelines, deeper wells or demand more energy to clean up before they are used. In theory, clear glacial melt water delivered to your tap by gravity requires no energy to get there. At the other extreme, current desalination technology uses 13,800 kilowatt hours to create a million gallons of clean water. When the energy used at the wastewater treatment plant is considered—and depending on the number of factors such as geography, pump efficiencies, leakage rates and waste-water treatment needs—municipal water systems can use between 1,050 and 36,200 kilowatt hours per million gallons. Most typical municipal water supply systems will use between 2,000 and 20,000 kilowatt hours per million gallons of water delivered.

Given the intricate relationship between energy and water, it is not surprising that the era of dam building may not be over,

[2] Ibid.

[3] *Energy's Water Demand: Trends, Volunerabilities and Management*, Nicole T. Carter, Congressional Research Service, 2011.

[4] River Network, *Carbon Footprint of Water*, 2009 - Table derived from Klein, Gary, Ricardo Amon, Shahid Chaudhry, Loraine White, et al.

especially in places where the demand for public water supply and energy use are both growing. In the Yakima watershed in the State of Washington, environmentalists, Native Americans and irrigators have been talking for years with the goal of restoring environmental flows for salmon. These groups are now supporting studies for two water storage projects as an alternative to pumping vast amounts of water 1,287 vertical feet from the neighboring Columbia River to the proposed Black Rock Reservoir.[5]

What We Can Do

The water-energy nexus is only as strong as its many interconnections, some of which we can break. For example, water conservation programs that promote water efficient fixtures and appliances (such as low-flow toilets, showerheads, faucets, dishwashers, washing machines, etc.) could be supported by energy utilities. And water utilities should be allowed to invest in conservation fixtures installed in your house. Water protection groups should be working to save energy as well as rivers.

By 2050, as many as 1,100 U.S. counties may be danger of running out of water.[6] Many are already considering energy-intensive water supply options such as deeper wells to keep up with declining aquifers, new inter-basin pipelines, new dams and even desalinization. Water conservation, efficiency and reuse strategies should be used to reduce climate change and the carbon footprint of our water use. So, where should we begin?

1 **Get Your Water Utility on Board.** The first priority for reducing the energy needed to pump water through your town should be to pump less of it. Eliminate leaky underground pipes and modify pressurization systems to reduce frictional losses and "non-revenue" water use. The Alliance for Water Efficiency, the Water Utility Climate Alliance and the U.S. EPA's Climate Ready Utilities Program are great resources for local utilities.

Encourage your local utility to use EPA's 'Climate Resiliency Evaluation and Assessment Tool' (CREAT). The program assists drinking water and wastewater utilities to better understand potential impacts of climate change and the related risks to the utilities.

2 **Restructure Water Prices.** In 2007 a national survey found that 38% of utilities have rate structures that reward stewardship and penalize waste. But conservation incentives are needed for water utilities as well. Some utilities have "decoupled" water use from water bills and structured cost-recovery programs to cover their reasonable costs for implementing leak reduction and conservation programs.

3 **Reduce Outdoor Irrigation Use.** Summertime peak water demand often is the key reason utilities need their most energy-intensive back-up water sources. Water conservation programs that emphasize smart irrigation practices and landscaping with locally-adapted species that require less potable water can save massive amounts of water and energy.

4 **Reduce Carbon Intensive Water Use.** There are many programs to reduce hot water use such as green-plumber building codes and showerhead replacement programs. In your own home, use the cold water cycle in your clothes washer except for special cleaning needs. Clothes washers with highly effective spin cycles allow you to

[5] *Evaluation of the Black Rock Project's Pumped Storage Power Costs and Benefits*, Larry Felton, Energy Northwest, January, 2007.

[6] www.nrdc.org/globalWarming/watersustainability

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use the dryer less—or use the clothes line. Commercial water conservation fixtures such as pre-rinse spray valves for restaurant kitchens are also important tools that can help reduce hot water use.

5 **Conserve Indoor Cold Water.** Indoor water use is still the largest share of domestic water use in America, and the biggest water users are our toilets. Older models use approximately 3.5 gallons of water per flush, while new efficient toilets consume 1.28 gallons per flush. The U.S. EPA estimates that if just 1% of American homes replace an older toilet with an efficient WaterSense labeled toilet, nationally, we could save more than 38 million kWh of electricity annually—enough to supply more than 43,000 households with electricity for one month. Indoor leaky pipes are another water waster. Toilet rebate programs, financial incentives for switching out old units and youth-summer job programs for urban communities are just a few successfully piloted programs.

6 **Protect Groundwater.** Paving over our watersheds reduces groundwater recharge, causes huge additional water pollution problems and creates massive additional water treatment costs. Communities can improve groundwater conditions and reduce future infrastructure costs by restoring stream banks and requiring vegetated buffer strips.

Low Impact Development (LID) helps protect watershed functions and allows communities to pay less for new sources of drinking water. In California, an NRDC Study shows how implementing LID would be like taking nearly 100,000 cars off of the road.

7 **Provide Low-Carbon Water Sources.** Not all reused water is low-carbon, if it requires extensive treatment. However, rainwater harvesting and gray water re-use can significantly reduce the demand for potable water. Communities can plan to use retained stormwater or treated wastewater

Join the Campaign

Over the next two years, the **Water and Energy Working Group** will help local and national conservation leaders come together and create opportunities for change. River Network will take on several roles within the Water and Energy Working Group:

- establishing peer learning networks and regional collaborations;
- engaging key regional and national partners in the water and energy sectors;
- providing communications on the water-related impacts of climate change between agencies, environmental groups, scientists, watershed groups and private funders;
- building the capacity of groups in the campaign for successful local action.

Contact River Network's Water and Energy Program staff to find out how you can get involved, or go to the Campaign to Sustain Water and Energy page at **www.rivernetwork.org/blog/33/2011/03/02/campaign-sustain-water-and-energy**. Take the quick survey at **www.rivernetwork.org/forms/water-energy-survey** to tell us about how climate change is affecting your watershed, what you are currently doing to mitigate the impacts of climate change on your watershed, and how River Network can help you continue or expand on those efforts.

for irrigating golf courses, washing cars, making snow for resort use and many other low-quality needs.

8 **Be a Trend Breaker.** Working collaboratively across sectors may be the best way to break the increasing water and energy use. Stakeholder groups are working towards adopting local water budgets, water conservation plans and other local climate-response processes. You can join a peer-learning group focused on developing these new strategies with River Network.

9 **Enroll in School.** Nominate your community to participate in Climate Solutions University or similar program. The CSU is an innovative and scalable online educational campus for rural forested communities.

10 **Teach Yourself, Look** at the work of NOAA and academic groups such as the Climate Impacts Group at University of Washington for "downscaled" climate projections. Investigate the technical resources on water-related impacts of energy development in places like the University of Texas, Austin and national science labs such as Sandia and the National Renewable Energy Laboratory. The Alliance for Water Efficiency maintains a state-by-state database of water conservation rules and tools for helping your water utility reduce their water and energy use.

Climate Change is Water Change

Water change is something everyone can see. This issue of *River Voices* explores how citizen groups are responding to the water-related impacts of climate change. Some have built collaborative efforts spanning economic interests and governmental jurisdictions. Others are leading on-the-ground projects like watershed monitoring and flow assessment. Some are helping their communities conserve water, develop green jobs or reduce energy use.

Recently, more than 20 organizations agreed to become part of the Water & Energy Nexus Working Group to support each other's work and build our nation's capacity to sustain water and energy. This effort—facilitated by River Network—will help watershed leaders learn from each other and raise these issues in their own communities.

Your local weather may trend towards drought, more rain, less snow or more flooding. But regardless of where you are, climate change means less water security. It is time to set aside philosophical battles and work together in anticipation of water change.

River Network thanks the initial members of the Water Energy Working Group for their contributions to our campaign strategy:

Jennifer Hoffner, American Rivers; Jill Ryan, Freshwater Future; Lynn Broaddus, Johnson Foundation; Margo Farnsworth, watershed consultant; Mary Ann Dickinson, Alliance for Water Efficiency; Nadia Madden, Union of Concerned Scientists; Paul Paryski, New Mexico Governor's Blue Ribbon Water Task Force; Steve Fleischli, Natural Resources Defense Council; Steve Malloch, National Wildlife Federation; Wendy Smith, World Wildlife Fund; Zach Cockrum, Trout Unlimited; April Ingle, Georgia River Network; Beth Stewart, Cahaba River Society; Bob Zimmerman, Charles River Watershed Association; Dean Naujoks, Yadkin Riverkeeper; Diane Minick, Upper Etowah River Alliance; Eleanor DelBene, Interfaith Environmental Initiative of Alabama; Elizabeth Riggs, Huron River Watershed Council; Gwen Griffith, Cumberland River Compact; Helen Sarakinos, River Alliance of Wisconsin; Hilary Lambert, Cayuga Lake Watershed Network; Jennison Kipp, Univeristy of Florida, PREC; Jill Albans, Clark Fork Coalition; Joan Clayburgh, Sierra Nevada Alliance; Karen Schapiro, Milwaukee Riverkeeper; Liz Paul, Idaho Rivers United; Marc Alston, Colorado Watershed Assembly; Sara Peel, Wabash River Enhancement Corp.; Zach Frankel, Utah Rivers Council.

Thank You

Water = Energy:

Lessons from Our Great Grandparents

by Steve Malloch
National Wildlife Federation
http://online.nwf.org

"Geez, Dad, water is heavy."

In the summer of 2010, I took my family camping at a Bureau of Reclamation reservoir in the Cascade Mountains of Washington State as an opportunity to expose my 14-year old daughter to some of my work—and to have fun. So between looking for bull trout, hugging old growth Douglas Fir and canoeing, I asked her to pump water.

She quickly noticed things that our great grandparents knew well. Pumping water, whether from a hand-pumped well or through a modern water filter, makes your arms tired. It is hard work to lug water from source to use. Heating water takes a lot of fuel. And she quickly noted that wasting water made all those tasks harder.

In the hydro-political world, these lessons need to be relearned. It takes an enormous amount of energy to heat, treat and transport water. River Network, one of the leaders in this issue, estimates that roughly 13% of U.S. electricity use is attributed to water use. California, which pumps water long distances, uses 19% of its electricity and 30% of its non-power natural gas to heat, treat and move water. It also takes an enormous amount of water to supply our energy. About half of all water used in the United States cools nuclear, coal and other thermal electric power generation.

New forms of fossil energy production, such as "fracking" shale to extract natural gas, and stripping oil from tar sands and oil shale take huge amounts of water. Even renewable energy sources take water:

- thermal solar power can use large amounts of water;
- geothermal generation depends on hot water; and
- evaporation from hydropower reservoirs can be significant.

Nationally, we need new policies that address these issues. How should we best address the connections between energy production, energy use and water? Federal agencies (and a few states) are joining research and advocacy organizations to develop the data upon which policy will be built. Some approaches, however, are already clear. Conservation of energy or water has cross-resource benefits—saving one, saves the other. Water availability is increasingly part of the energy production facility siting process, and its importance will only grow.

Locally, there are real opportunities to make progress by using these energy and water connections.

On the water side, water conservation becomes even more compelling. Water advocates have long recognized the benefit of water conservation in reducing impacts on habitat and water quality. Now, energy

conservation is a useful approach in advocating for water conservation. Every gallon of water that is conserved represents energy not used in supplying water, treating water before use, heating water in use, and then treating water again in a wastewater treatment plant.

Engaging public utility commissions and energy suppliers in recognizing the energy benefits of water conservation is a new front. While some power and water utilities are already jointly offering rebates for efficient clothes washers, that is only the start of the possible connections. California's Energy Commission has led the nation in recognizing power benefits of water conservation, and in fact identified it as the most promising cost-efficient area for energy conservation. Working with state public utility commissions on cross-resource conservation is potentially a fertile field.

Between climate change and geo-politics, the nation's energy systems are being reworked, with often unrecognized implications for water. "New" energy sources as disparate as oil shale, tight formation natural gas, thermal solar and ethanol have significant water demands that must be addressed in policy and facility impact analysis. Because these development decisions are often local, there is an opportunity for River Network Partner groups to be in the lead on energy and water issues in their own watersheds.

Of course, as my daughter discovered, water and energy issues can come home with us wherever we live. If a 5 minute hot shower uses as much energy as burning a 60-watt light bulb for 14 hours, how much energy will we use in the shower when we get home from our camping trip? This is the kind of decision we make every day that reflect this connection between energy and water.

Saving Water = Saving Energy

The Energy Water Collision

John Rogers &
Erika Spanger-Siegfried
Union of Concerned Scientists
www.ucsusa.org

The way we make and use energy threatens our freshwater supplies. A new Union of Concerned Scientists initiative throws a spotlight on this overlooked crisis.

When it comes to energy and water, it's hard to have one without the other—producing energy uses water, and providing freshwater uses energy. Power plants, for example, use water to cool the steam that spins electricity-generating turbines; fuel producers use water in the mining of coal, extracting of petroleum, and growing of crops for biofuels. Conversely, using water in our communities requires energy to get it there, treat it, heat it and more. Because of these links between energy and water, problems for one resource can create problems for the other, and the energy-water connection can easily turn into a collision.

The energy choices we make today and in the future will therefore have a major impact on our water supplies and the energy sources that depend on them. The Union of Concerned Scientists (UCS) has launched a new initiative to examine the nexus between water, energy and climate change, and to identify and promote clean-energy solutions that can reduce global warming emissions while protecting our water supplies. What follows are just some of the findings of our initial research.

Thirsty for Power

The U.S. electricity system requires an enormous amount of water to function: just one day's worth of electricity generation requires more than 140 times the water used by New York City. More than half of the country's nuclear power reactors, and almost half of our coal-fired power plants, use "once-through" cooling, meaning they withdraw water from nearby water bodies, pass it through the plant to cool the steam and return it to the source. Each of these plants withdraws between 20 and 60 gallons of water for each kilowatt-hour of electricity it generates, far exceeding the amount of water used in homes directly (see the sidebar on page 11).

Some plants lose large amounts of this withdrawn water to evaporation. For example, just one typical 600-megawatt coal-fired power plant loses more than 2 billion gallons of water annually—an amount that could fill more than 3,000 Olympic-sized swimming pools.

In Hot—and Dirty—Water

Water discharged from a coal or nuclear plant is hotter—by an average of 17 degrees Fahrenheit (°F) in summer—than when it entered the plant. Half of all coal plants report releasing water in the summer at peak temperatures of 100°F or more. This thermal pollution can stress or kill fish and other wildlife.

Thermal pollution is not the only danger to water supplies, however. Arsenic, mercury, lead and other toxic substances contained in coal plant waste can severely contaminate drinking water supplies. Mountaintop-removal coal mining has buried almost 2,000 miles of Appalachian headwater streams—some of the most biologically diverse streams in the country. And while natural-gas-fired

power plants are less water-intensive than coal or nuclear plants, extracting gas from shale deposits can affect water quality and strain water supplies in local communities.

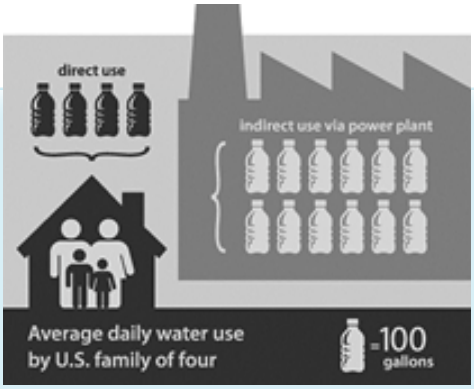
Water Unrest

Water supply conflicts are growing across the United States, particularly in the West, where farmers, electric utilities, cities and other water users all compete for the same limited resource. Even without factoring in the exacerbating role of climate change (see below), conflicts over water are considered highly likely in major Southwest cities such as Albuquerque, Denver, Las Vegas and Salt Lake City by 2025.

Such tensions are not confined to arid regions. In the Southeast, drought has brought simmering disputes between states like Georgia, Tennessee, Alabama and Florida over the rights to key rivers to a boiling point in recent years. By 2030, electric capacity is predicted to grow nearly 30 percent in the western United States and 10 percent in the Southeast—a trend that raises the difficult question: With what water?

Climate Complications

Compounding the issue of competing water demands are the effects of global warming. Increasing climate variability—in the form of extreme heat and extended drought, in particular—is already testing the resilience of energy and water systems in some regions. Further climate change will pose far-reaching challenges. The Northeast and Midwest, for



Graphic's credit: © Tyler Kemp-Benedict

Hidden Water Use in the Home

We all use hundreds of gallons more than we may realize.

Between the kitchen, bathroom, laundry and yard, the average U.S. family of four uses about 400 gallons of freshwater per day—not including the water required to generate the electricity this family uses. Assuming their home is powered by a coal-fired or nuclear power plant that takes lake or river water for once-through cooling; this family's electricity use requires an additional 600 to 1,800 gallons of freshwater per day. Just one load of hot-water laundry (using an electric washer and hot-water heater) uses 3 to 10 times more water at the power plant than inside the washer itself.

This indirect—but massive—water use related to energy consumption underscores the need to invest in water- and energy-saving appliances at home—which will save consumers money in the long run while protecting our natural resources. In addition, consumers can support cleaner electricity generation by purchasing "green power" (from low-water resources such as wind) from their electric utility.

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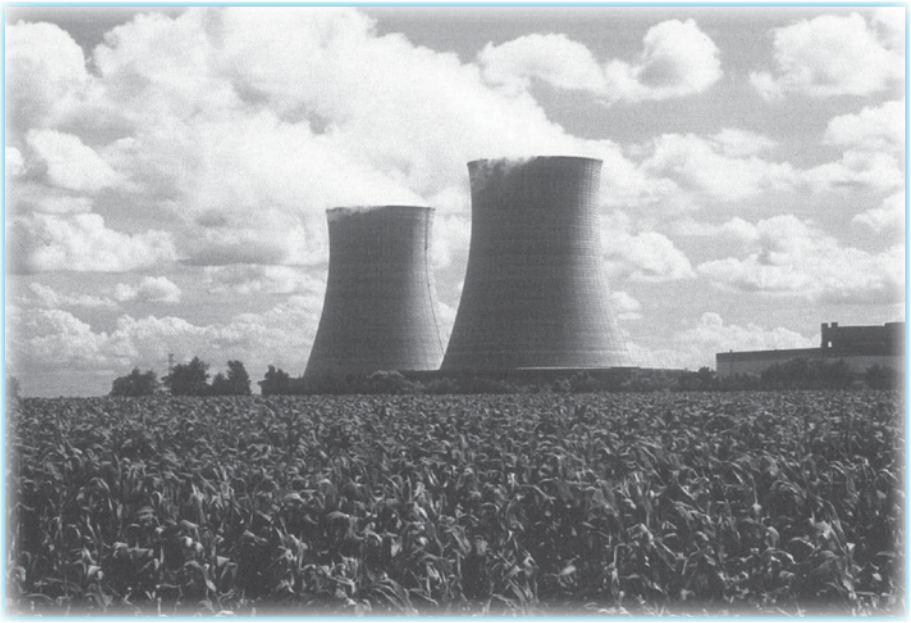

example, can expect changes in seasonal precipitation patterns including more spring flooding and extended summer drought. In the Southeast, instances where water is too warm for power plants to use for cooling may become much more frequent. The Southwest can expect far less runoff and precipitation, especially in the warm months, while longer, more severe droughts will leave arid areas even drier.

Since 2004, water stress has forced at least a dozen U.S. power plants to temporarily reduce their power output or shut down entirely. The Browns Ferry nuclear plant in Alabama, for example, was forced to cut the power output of all three of its reactors for nearly five straight weeks in 2010, when nearby water temperatures hit 90°F—all while cities in the region were experiencing high power demands due to heavy use of air conditioning. This and other water-related shutdowns have prompted at least eight states to reject new power plant proposals.

Avoiding a Disastrous Collision

A number of technologies can help the United States shift to a low-carbon, low-water energy system. The easiest to implement are also the most cost-effective: energy- and water-efficient appliances, buildings and vehicles. Old coal and nuclear power plants can also be made more water-efficient with cooling technologies that could reduce water withdrawals by two orders of magnitude (though more water would be lost to evaporation than before).

Shifting to non-fossil-fuel sources of energy could further reduce our water use—if we make the right choices. Biofuels, for example, have the potential to reduce the environmental impacts associated with gasoline use, but the "water footprint" of conventional biofuels such as corn ethanol can be very large. Creating a single gallon of corn-based ethanol consumes, on average,

Shifting to non-fossil-fuel sources of energy could further reduce our water use—if we make the right choices.

about 100 gallons of freshwater—some 15 to 30 times more than it takes to produce a gallon of gasoline. In some regions, ethanol production can take three or more times that amount, depending on irrigation needs. However, the water requirements for producing a gallon of "cellulosic" biofuel from low-water grasses or waste wood may require as little as 2 to 10 gallons of water. Non-plant fuel sources such as animal waste or even garbage could lower the water requirements of biofuel production even further.

Wind turbines and solar photovoltaic panels can generate electricity without any water, while concentrating solar power plants, which traditionally require significant amounts of water, can avoid straining water supplies by using dry cooling (albeit at a higher cost).

As our new energy-water initiative continues, UCS will work with decision makers and other important stakeholders—representing agriculture, fishing, river protection, water conservation and clean energy, among others—to ensure government policies support energy solutions that reduce both carbon emissions and the strain on our freshwater supplies. Working together, we can not only avoid the worst impacts of climate change, but also make our energy supplies more resilient in the face of a water-constrained future.

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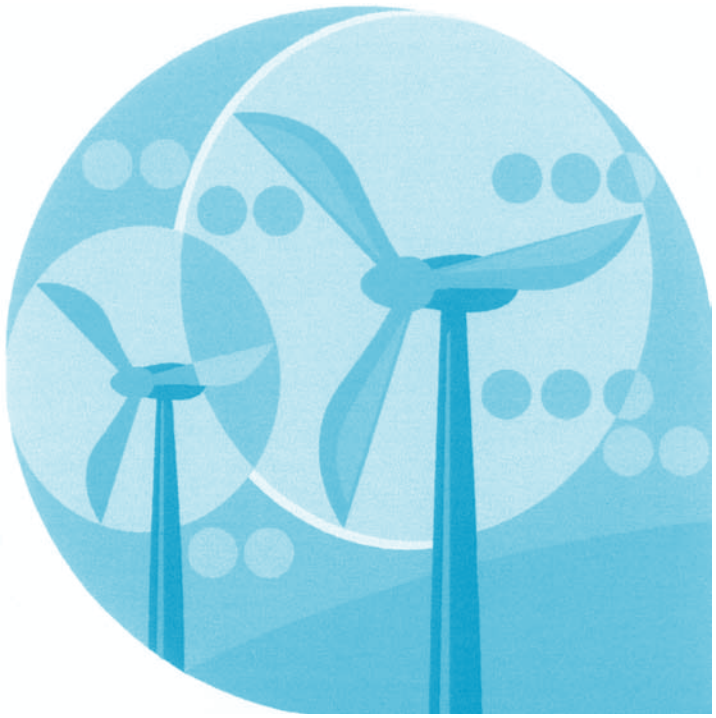

How Much Carbon Does Your Stormwater Emit?

By Valerie Strassberg,
Nature's Voice Our Choice
www.naturesvoice-our-choice.org

Low Impact Development (LID) adheres to the principal of managing rainfall where it lands by slowing, spreading and cycling more of the water instead of paving, piping and polluting the natural flow.

Many of us in the water conservation community understand the inherent benefits of LID and Green Infrastructure (GI), but these applications also have a role in reducing carbon emissions. While there are many natural phenomena that release carbon, such as forest fires and wetlands, the largest culprit of CO_2 emitted from human activities comes from the burning of fossil fuels for energy. Our modern water treatment (WT) and wastewater treatment (WWT) systems require vast amounts of energy, with average national energy intensities of 2,740 kWh/MG and 1,570 kWh/MG, respectively. Yet these values can vary widely based on location, water source, treatment type and transport distance (see chart on page 4). While such energy input may be justified for human consumption, it becomes harder to defend when 30% - 70% of all domestic irrigation relies on municipally treated potable water (Strassberg & Lancaster, 2011).

If our human-designed landscapes were better able to accept the flows from rainfall and runoff, their use of potable water could be drastically reduced. Furthermore, LID and GI could help many communities reduce the energy required for treating stormwater runoff.

In nearly 700 communities across the nation, runoff is collected in the same pipe as sanitary flows and treated at a WWT facility. These communities with combined sewer overflow (CSO) problems now face the management challenge of separating the two systems. One common solution is to build tunnels, caissons or other below ground reservoirs that detain runoff until after a storm event, and lessen the burden on a given WWT plant. Later, this combined sewer water is pumped up and treated at the WWT plant. In Chicago, their tunnel and reservoir plan (TARP) consists of a complex 93-mile tunnel system, up to 33 feet in diameter, to store runoff during rainfall events. Yet pumping the volumes of water captured in this expansive system requires nearly the same amount of energy as the treatment process itself, effectively doubling the energy required for treatment. While such innovations have helped manage the health and safety issues of flooding and raw sewage discharges into water ways, they have

come at a heavy price both in energy and economics. LID can be used to sustainably integrate both the safety and the costs.

All too often, stormwater is managed to convey all flow off-site regardless of the rainfall event size. In the City of Ann Arbor, Michigan, more than 76% of all rainfall events results in less than 1 inch of rain. The natural landscape could easily absorb that amount of water and in fact relies on an equal, if not greater amount of water for irrigation. But the City of Ann Arbor's standard for sizing stormsewer pipes is based on 2.72 inch rainfalls (a 10-year/12-hour duration storm). This design standard assures that rainwater is shuttled offsite, only to be replaced later by energy-intensive treated irrigation water. When GI treatments such as green roofs, raingardens, porous pavement and others are used to capture rainfall where it lands, sites are naturally irrigated and runoff is minimized.

Such straightforward applications of LID principals can have major energy and CO_2 savings such as:

- A greater reliance on local water resources;
- A reduction in massive centralized infrastructure; and
- Lessened alterations of natural ecosystems.

Each of the items also helps mitigate climate change. If systems are designed to handle more of the rainfall onsite, and only engage overflow systems during the larger events (e.g., in Ann Arbor, greater than 1" of rainfall event), then less treated water will be required for irrigation. With less water demand comes less energy demand for treatment. Furthermore, if existing and future systems are built to accommodate just the overflow, instead of all-the-flow, pipes and other engineered structures can be minimized. In turn minimizing the energy embedded in producing, transporting, installing and maintaining such systems. Finally, less water transported from one watershed to another means less impact on the natural ecosystem. This saves energy and increases carbon sequestration.

Water's Tie to Climate

A Reliance on Imported Water

We are in an era where bumper stickers boast "buy local" and combating climate change means cutting down on the distance we transport goods and services. Yet customers buying municipally-supplied water don't receive a sticker telling them where it is shipped in from. Many communities rely on treatment plants stationed many miles, sometimes even counties, away from their faucet. A prime example is Los Angeles, CA. Because Los Angeles has so much excess pavement, rainwater rushes off those sealed surfaces, flooding the Los Angeles River and

GUIDE TO ABBREVIATIONS

CO_2e	Carbon Dioxide Emissions	LID	Low Impact Development
CSO	Combined Sewer Overflow	MG	Millions of Gallons
FOS	Factor of Safety	MT	Metric Tons
GHG	Greenhouse Gas	TARP	Tunnel and Reservoir Plan
GI	Green Infrastructure	WT	Water Treatment
HDPE	High-Density Polyethylene	WWT	Wastewater Treatment

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Aerial view of Los Angeles

spreading into neighboring cities instead of seeping into the ground. As this stormwater is not captured, Los Angeles must pipe a large amount of water from across the mountains, requiring vast amounts of energy and displacing water from one area into another. In southern California, the energy intensity of the water supply system is 4 times greater than the national average. The Los Angeles water system uses an average of 7,770 kWh/MG to supply water to nearly 16 million people living in and around the city, further adding to greenhouse gas (GHG) emissions (Strassberg & Lancaster, 2011).

Utilizing LID and GI solutions to capture the overflow (rather than pipes that capture all the flow) would involve peeling back the pavement, creating more pathways for water to infiltrate and cutting down on the amount of potable water required for irrigation. The GHG reduction can be quantified in the volumetric reduction for irrigation, for treatment and for infrastructure.

Increased Reliance on Massive Centralized Infrastructure

The term "factor of safety" (FOS) is one of the first concepts taught to engineers in college. The FOS is the pinnacle difference between the engineering profession and others. Engineered systems, like that of stormwater conveyance, must be designed to ensure the maximum FOS for the largest number of people possible. If a proper FOS is not used, flooding and devastation could occur resulting in the loss of human life. With such heavy burdens to meet, it is no wonder our present centralized stormwater systems have been over-engineered. The minimum pipe diameter of most urban stormwater systems is approximately 8 inches, while the average is approximately 24 inches. The indiscriminate pavement, curbs and other conveyance systems that feed into the piping contributes to the volumes conveyed. While these systems are designed to capture the largest events, they actually capture the majority of events. By using GI to capture smaller events, we can cut down on the amount of pipe, concrete and infrastructure required. For example if a community is forced—due to development or demand—to upgrade a water main from an 8" concrete pipe to a 10" high-density polyethylene (HDPE) pipe, the related CO_2 emissions from the installation (assuming an open trench pipe) relates to 42 MT CO_2e (metric tons of Carbon Dioxide equivalents) per mile installed (Ariarathnam & Sihabuddin, 2009).

A New Era of Investigation

The long-term benefits to a community are inherently greater when systems are designed to accommodate the natural environment rather than transform it. By decreasing the materials for infrastructure and maintenance, employing native vegetation that requires less water, and developing land for run-on instead of runoff, the energy reduction and environmental improvements can be substantial. For example, if the City of Chicago were to replace half a square mile (0.25% of the city's total area) of pavement with an integrated porous pavement and infiltration basin system, they could avoid 556 MG (millions of gallons) of water annually from flowing into the TARP, thereby avoiding pumping and treatment. And if that same volume was incorporated into the irrigation schematic for urban street trees, planter boxes or rain gardens, the total annual avoided energy in both water and wastewater treatment could reduce carbon emissions by approximately 2,300 MT (Strassberg & Lancaster, 2011).

Although LID and GI practices all have quantifiable relationships to CO_2 emissions, they are not as straightforward to measure as that of a streetlight or a vehicle. While most agencies collect some water and energy data, few closely track the energy consumption of individual components of their facilities or of their system as a whole (Hallet, 2011). Energy information such as a vehicle's fuel requirements is easily obtained; energy consumption at a WT or WWT plant is less so. Most comprehensive energy intensity studies have come from California. This includes the latest report from the California Public Utilities Commission Energy Division entitled: *Embedded Energy in Water Pilot Programs Impact Evaluation*, 2010 (See page 20).

We seem to be stuck—which should come first: widespread implementation of GI, or pilot studies proving these systems work? Federal agencies, water management, technicians, consultants and nonprofits alike should research the applications that are working. Shifting to "green" stormwater management solutions will require new information and new data sets that better predict biological processes. Professionals, decision makers and federal agencies need to understand the larger role stormwater management plays in the built environment and embrace LID practice as the norm rather than the alternative.

A Blueprint for Water & Energy

By Steve Nadel
Executive Director,
American Council for an
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www.aceee.org
and
Mary Ann Dickinson
President & CEO
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When are we going to get serious about conserving water and energy in this country? It seems every local conservation leader has asked this question at some point. In December 2010, the Alliance for Water Efficiency (AWE) and the American Council for an Energy-Efficient Economy (ACEEE) convened a panel of national experts to develop an integrated, national blueprint towards more efficient water and energy use. The facilitated session involved leading academics, state and federal agencies, and national environmental interests. The outcome of this joint process, *A Blueprint for Action and Policy Agenda* (*Blueprint*), was released in May 2011.

The potential synergies between water and energy conservation efforts seem to cry out for national attention. Water and energy are "interdependent" resources. As much as an eighth of the nation's electricity goes towards supplying fresh water (including developing new sources, pumping, heating and treating) and half of our surface water goes toward producing thermoelectric electricity. When we waste one of these resources, we almost inevitably waste the other at the same time.

"In simple terms, every drop of water saved, saves energy, and every kilowatt of electricity saved, saves water."

Mary Ann Dickinson, President and CEO of AWE

Why don't we have conservation programs, pricing, planning and policies that look at both at the same time? It is because of our "silos." Every agency has them. You know—the one that keeps the Energy Program staff from talking to the Water Program staff in the same organization. You know—the one that keeps your statutorily authorized

program from coordinating with the latest interagency collaboration. But, how, exactly, do we break those down?

Not surprisingly, the organization premises upon which many watershed groups are built may be part of the answer. The *Blueprint* focuses on eight policy "themes" that should be used to approach the problem, themes not unfamiliar to individuals in the watershed conservation community:

1. Increase the level of **collaboration** between the water and energy communities in planning and implementing programs.
2. Achieve **a deeper understanding** of the energy embedded in water and the water embedded in energy.
3. Learn from and replicate **best practices** which integrate energy-water efficiency programs.
4. Integrate water into energy **research efforts** and vice versa.
5. Separate **water utility revenues** from unit sales, and consider regulatory structures that provide an incentive for investing in end-use water and energy efficiency.
6. Leverage existing and upcoming **voluntary standards** that address the energy-water nexus.

Blueprint for Water & Energy
5 Priorities

Here are five actions that should be undertaken as a first priority. Both AWE and ACEEE are committed to getting these five actions underway as quickly as possible.

1. Cost effective building codes, equipment standards and tax credits, including national model residential and commercial building codes, Department of Energy efficiency standards and tax incentives.
2. Best management programs addressing the energy-water nexus. Identify the elements contributing to success of these programs so they can be replicated by other programs.
3. Address the pricing of water services and rate-related barriers to efficiency program implementation, clarifying utility disincentives for efficiency.
4. Develop baseline data on the energy used by water and wastewater utilities and the water used by electric utilities (including raw water transmission and treatment; treated water distribution; and wastewater collection, treatment and disposal energies, not just energy use at the plant level).
5. Establish workgroups to increase cooperation among energy and water agencies, utilities and communities, to share best practices and recognize the water-energy nexus as the first step toward working together.

7. Implement codes and **mandatory standards** that address the energy-water nexus.
8. Pursue **education and awareness** opportunities for various audiences and stakeholders.

AWE and ACEEE will use the *Blueprint* to guide future combined efforts on research, policy, codes and standards and programs looking at water and energy efficiency holistically. The *Blueprint* lays out paths for progress in each of those areas, providing a concrete challenge to funders, researchers and program implementers. The joint policy agenda identifies ways the energy and water communities plan to work together as they approach policymakers.

"With the publication of this blueprint, the water and energy efficiency communities are committing to work together to achieve the substantial economic and environmental benefits that can result from increased efficiency."
Steven Nadel, Executive Director of ACEEE

There isn't a silver bullet—a specific program, policy or local initiatives—that will realize the full potential of water conservation in this country. But if local groups can use this new tool to begin conversations in their own communities, we will have started a national discussion.

FOR MORE INFORMATION

To view the *Blueprint*, an Executive Summary, and additional resources, go to **www.allianceforwaterefficiency.org/blueprint.aspx**

The **Alliance for Water Efficiency (AWE)** is a stakeholder-based 501(c)(3) nonprofit organization dedicated to the efficient and sustainable use of water. Located in Chicago, the Alliance serves as a North American advocate for water-efficient products and programs, and provides information and assistance on water conservation efforts. Visit **www.allianceforwaterefficiency.org**.

The **American Council for an Energy-Efficient Economy (ACEEE)** is an independent, nonprofit organization dedicated to advancing energy efficiency as a means of promoting economic prosperity, energy security and environmental protection. For information about ACEEE and its programs, publications and conferences, visit **www.aceee.org**.

Embedded Energy in Water Pilot Programs

by Tom Souhlas
and
Mark Buckley
ECONorthwest
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In 2006, the California Public Utilities Commission (CPUC) asked Investor-Owned Utilities (IOUs) to participate in pilot programs to investigate potential energy savings in the supply system. Each of the four largest IOUs partnered with one large water provider to implement a jointly-funded program designed to maximize embedded energy savings relative to program costs. Embedded energy is the amount of energy needed to acquire, pump, treat, distribute and operate water treatment and delivery systems for a given amount of water.

The nine pilot programs focused on efforts that would conserve water, use less energy-intensive water and make delivery and treatment systems more efficient. In December 2007, the CPUC approved a series of pilot programs proposed by Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE, and San Diego Gas and Electric Company (SDG&E) (Table 1). The pilot programs were initiated in July 2008 and concluded in December 2009. The CPUC contracted with a team led by ECONorthwest (ECONW) to evaluate the performance of these pilot programs.

Table 1
Short Descriptions of the Pilot Programs Evaluated

PG&E Large Commercial Customers – This program offered audits to large commercial, industrial and institutional customers and recommended water efficiency improvements.
PG&E Low Income High Efficiency Toilets (Single-family) – This program offered direct-install, high-efficiency toilets (HETs) to low-income customers living in single-family residences served by PG&E and partner water agencies.
PG&E Emerging Technologies – PG&E partnered with two water agencies to integrate real-time electricity consumption data from water pumping into existing SCADA systems. This program was not designed to conserve water, and instead focused on reducing energy consumption under different flow and pressure conditions.
SCE Low Income High Efficiency Toilets (Multi-family) – This program offered direct-install, high-efficiency toilets to low-income customers living in multi-family residences served by SCE and partner water agencies.
SCE Express Water Efficiency – SCE partnered with Metropolitan Water District of Southern California (MWD) to deliver pH controllers for cooling towers and Weather Based Irrigation Controllers (WBICs) to commercial customers with chilled water HVAC and/or large landscape irrigation systems.
SCE Leak Detection – For this program, detailed water audits, compliant with International Water Association and American Water Works Association protocols, were completed for three water agencies.
SDG&E Managed Landscapes – SDG&E hired a contractor to install proprietary equipment and software that converts conventional irrigation controllers into controllers that use daily evapotranspiration (ETo) and weather information to automatically and dynamically control the amount of water used for irrigation.
SDG&E Recycled Water Retrofits – This program increased the use of recycled water by providing capital funding for planned retrofit projects that switched from potable water sources to recycled water sources.
SDG&E Large Customer Audits – For this program, SDG&E provided capital funding to install water conservation measures at sites that had received prior water audits and where the customer had not yet acted to implement any of the identified measures. It also developed and implemented new, integrated water-energy audits for large commercial, industrial and institutional high water users in San Diego County.

Evaluation

The primary objective of ECONW's evaluation was to identify and quantify the amount of embedded energy savings (kilowatt hour (kWh)/year) associated with each pilot program. In other words, facilities to better understand the energy-savings impact of water-saving measures, ECONW quantified the amount of energy needed to bring water supplies to end-user. The evaluation of the pilot programs had two primary components:

- Measure end-use water savings. For most of the pilot programs, ECONW used water-meter data spanning a period of 2 to 4 weeks before and after the installation. For other pilot programs, ECONW used monthly water-billing data.
- Calculate embedded energy savings. ECONW determined the overall energy intensity of the water and wastewater systems serving the pilot programs' participants, then multiplied these energy intensities by the water/wastewater savings.

Results

For each pilot program, ECONW calculated the potable water savings (in terms of water savings and embedded energy savings), wastewater savings (in terms of water savings and embedded energy savings) and total embedded energy savings (see Table 2 on page 22). When looking at each program budget and just at the embedded energy savings, the SCE Leak Detection program provided the most energy savings per dollar spent during the one year of the program. While not down to the price of a kWh for one year, these program improvements would continue to provide benefits for more than the one year observed. Considering the useful life (e.g., about 50 years), the high efficiency toilets start to show some real energy cost savings.

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Table 2
Summary of Annual Potable Water, Wastewater & IOU Embedded Energy Savings

Pilot Program	IOU Budget	Potable Water Savings		Wastewater		Total Embedded Energy Savings (kWh/Yr)
		Ex Post Savings (Gallons/Yr)	Embedded Energy (kWh/Yr)	Ex Post Savings (Gallons/Yr)	Embedded Energy (kWh)Yr)	
PG&E Large Commercial Customers	$700,000	33,719,230	12,417	16,478,711	42,772	55,189
PG&E Low Income High Efficiency Toilets (Single-family)	$200,000	5,098,320	14,328	5,098,320	Not Measured	14,328
PG&E Emerging Technologies	$341,000	Not Applicable	0	Not Applicable	Not Applicable	0
SCE Low Income High Efficiency Toilets (Multi-family)	$200,000	1,329,768	5,538	1,329,768	174	5,712
SCE Express Water Efficiency	$133,000	6,351,000	Not Measured	6,351,000	9,385	9,385
SCE Leak Detection	$300,000	82,923,912	178,143	Not Applicable	Not Applicable	178,143
SDG&E Managed Landscapes	$250,000	51,772,695	21,275	Not Applicable	Not Applicable	21,275
SDG&E Recycled Water Retrofits	$250,000	31,847,172	75,205	Not Applicable	Not Applicable	75,205
SDG&E Large Customer Audits	$496,000	82,081,336	73,710	82,081,336	81,802	155,512

Similar patterns exist for potable water savings, where the cost per gallon saved even in the first year, less than a penny per gallon for several of the programs, is less than the cost per gallon for new (energy-intensive) water supplies typically considered in California like desalination or water reuse.

Data weren't available for the full life-cycle of all the projects, particularly on the wastewater side, and this was only a one-year look, so these water and energy savings measurements are generally underestimates.

Discussion & Recommendations

In addition to the direct potable water savings and the secondary wastewater avoided, all the pilot programs ECONW evaluated had positive embedded energy savings. In general, the energy savings

for the one-year study wouldn't justify the costs of the projects alone. But with a longer timeframe and the opportunities for improvements discovered during the process, some of these programs might be able to pay for themselves on the energy savings alone.

In many cases, the embedded energy savings may be higher than the results suggest. Data were insufficient or unavailable for ECONW to calculate the embedded energy associated with potable water and/or wastewater for six of the nine pilot programs. In some instances, the programs focused only on potable water or wastewater. In other cases, data were unavailable due to either lack of reporting or insufficient monitoring equipment. It was important to verify how the equipment actually performed. For example, the actual flush volumes on the toilets, high-efficiency and standard, tended to be higher than advertised.

There is also potential for actual behavior to influence these results over time. If people see their water and energy bill drop, they might be less careful and increase their usage. Similarly, some of the costs of these efficiency programs might not be directly paid by the beneficiaries, say if the efficiency gains are within the system and don't directly relate to utility bills. In this case, people don't necessarily see the efficiency gains as the result of an investment that they made and should try to pay off by keeping usage low. It's important to encourage the ethic of conservation of water and energy while implementing these types of programs so gains aren't given back up through increased water usage.

FOR MORE INFORMATION

To view the full report, please visit: www.energydataweb.com/cpucFiles/33/FinalEmbeddedEnergyPilotEMVReport_1.pdf

Whiskey's for Drinkin':

Dry & Wry Realities of Climate Change in New Mexico

by Paul Paryski

New Mexico Governor's Blue Ribbon Water Task Force

www.rivernetwork.org

In the West "whiskey's for drinkin' and water's for fightin'." That certainly is the case in New Mexico, where we are already experiencing the effects of climate change and global warming: drought, extreme weather events, wildfires, greatly diminished snowpacks which supply most of our water, increased temperatures and evaporation rates (>97% of New Mexico's precipitation of 100 million acre feet per year evaporates), greatly decreased in-stream flows and the migration of ecosystems northward and uphill. This spring we are being battered by drought, high winds and sandstorms. The International Panel on Climate Change predicts that the Southwest will be one of the regions most drastically affected by climate change. The 'fightin' over water resources is now becoming a battle.

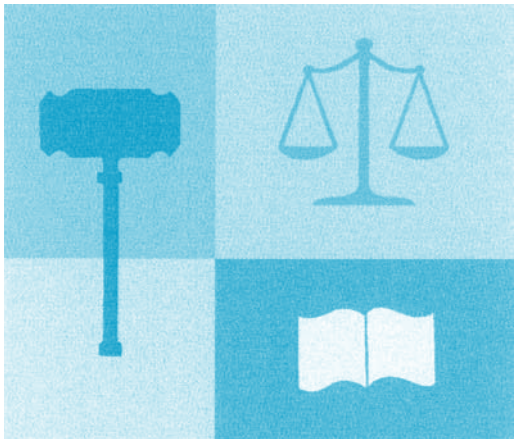
In past decade, I have worked with environmental groups, state water officials and agencies, and legislators to change practices, policies and law to help New Mexico more rationally and effectively manage our very limited water resources, whether surface or groundwater. The first step towards passing legislation is to gain the trust of decision-makers, lawmakers and other stakeholders, by understanding their concerns and presenting good factual arguments. It is also essential to thoroughly understand the complex, chaotic legislative process.

Collaboration between environmental groups and stakeholders usually opposed to environmental measures is a key element of success. In New Mexico such collaboration helped pass legislation allowing greywater reuse for irrigation, creating a state water plan, requiring or encouraging rooftop rainwater harvesting for irrigation and non-potable uses, local performance-based green building codes, and protection of endangered species and restoration of riparian zones. All are great victories that could serve as models for others.

But in New Mexico we are now facing a new battle. We are trying to mitigate and adapt to the impacts of both climate change and the misguided belief of our new Governor, Susanna Martinez, that commerce is adversely affected by good environmental practice, laws and regulations. The environmental community must contest her agenda in the courts and the legislature while helping the public understand that sustainable natural resources, healthy ecosystems and water are absolutely necessary for sustainable human development.

Real Steps to Fight Climate Change

- **Modify priority water law** (first in time-first in line for using water) in ways that encourage water sharing to better meet inevitable water shortages. Current priority law has pushed Indian Tribes and Pueblos to establish golf courses to prove beneficial use.
- **Pass more green building codes** to use water more efficiently and reduce greenhouse gases (GHGs);
- **Examine the energy-water nexus** (i.e., delivering water takes energy and producing energy takes water) and require energy producers to use less water and release less GHG's;
- **Promote and require both water and energy conservation** with local and state legislation;
- **Totally reuse water** where possible (e.g., toilet to tap);
- **Allow landscape water harvesting** (e.g., from paved surfaces);
- **Require water reuse and conservation**, while providing incentives, for commerce, industry and new subdivisions;
- **Protect in-stream flow, watersheds and riparian ecosystems** that in turn keep aquifers full and supply water;
- **Install hydroelectric facilities on existing dams** to produce low carbon footprint and virtually free energy;
- **Legislation to fund the above**;
- And, on a personal level, **consume less**.



Environmental groups in New Mexico, such as the Sierra Club, Amigos Bravos, WildEarth Guardians, the Santa Fe River Association and the Wilderness Alliance are working hard on our issues. More collaboration and coordination are needed to help our state take these important steps.

Luna Leopold, one of New Mexico's greatest environmentalists, wrote: *"Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land."* We are striving to keep New Mexico a Land of Enchantment.

Water & Climate Change in the Boise River Watershed

It's a challenge to advocate for water conservation and efficiency when water is cheap and seemingly plentiful. Conservation minded individuals are always ready to reduce their footprint on the natural world, but how can we instill a culture of water conservation in our communities so our rivers aren't sacrificed when climate-change panic sets in?

The Boise metro area receives little rainfall, but snow piles up in the headwaters, and three large reservoirs built long ago store spring snowmelt for summer use. Consequently, plenty of water is available most years. In drought years, irrigators have to make due with less, but most of the area's people drink groundwater, and residential shortages are unknown to date.

Scientists don't predict climate change will make it drier in the Boise River watershed, but they call for more severe and extended drought years. The Boise watershed is ill prepared to cope with prolonged drought, and irrigators have already begun to call for a new storage reservoir. No one talks about the impact a prolonged reduction in surface irrigation will have on groundwater supplies, but it's safe to say that climate change affects all water users.

Climate change also impacts the Boise River, primarily in the national forests of the headwaters. New water storage dams would worsen the situation.

Idaho Rivers United (IRU) is trying a number of strategies to establish a culture of conservation. Irrigation uses almost all the water diverted from the Boise River, and they are the ones calling for a new storage dam, but they are not very receptive to our efficiency message. We've developed a Water Security platform that explains why a new approach to water management is needed for the 21st century, but it doesn't call for irrigation efficiency. It's been a good conversation starter.

A strategy with more popular appeal is to promote municipal water efficiency as a way to reduce energy use/carbon footprint. We've developed educational materials for kids to adults that explain the carbon footprint of water and offer ideas to cut water use in your home and yard. For credence, we need local numbers, not national averages, so we've researched the carbon footprint of over 15 providers in our area. Because we fall far below national averages for energy embedded in water and greenhouse gas emissions per kWh, this won't be a central part of our campaign, but we weave it into all our water efficiency outreach, and it's a great way to connect with the energy efficiency community.

Idaho Rivers United has had good success in encouraging waterwise landscaping—many people want to get rid of their lawns—but other educators have stepped in, and we can move on. In 2011 we are tackling local food growers. The Boise area, like many others, is experiencing a boom in urban farming, and smart want-to-be growers look for plots that have access to irrigation water. The water is unmetered and virtually free, so there is little incentive to be efficient.

IRU is trying two approaches:

1. growing education about the real cost of that "free" water and the importance of sustainability coupled with water efficiency methods; and
2. encouraging municipal governments to require a certain level of water efficiency and provide incentives or rebates to defray costs for drip irrigation, soil moisture sensors and other equipment.

Idaho Rivers United (ID), www.idahorivers.org

How Do You Address Watershed Impacts of Climate Change?

Cook Inletkeeper is addressing both the need for more data to understand climate change impacts and the need for more public education about renewable energy and the imperative to stop burning coal and other fossil fuels.

Alaska's Cook Inlet is home to incredible wild salmon runs that provide steady, local jobs and fabulous food for the table. In Cook Inlet alone, fisheries account for over 1 billion dollars of economic output and salmon account for over half of that. But Alaska is ground zero for climate change and that means Cook Inlet's salmon, and the communities that rely on them, are at risk from the effects of climate change.

For the past eight years, Cook Inletkeeper and its partners have documented warm water in local salmon streams, with summer temperatures routinely exceeding state water quality standards established to protect spawning and migrating fish. High stream temperatures make fish increasingly vulnerable to pollution, predation and disease. Yet there is little consistent, long-term temperature data for salmon streams in Alaska.

Cook Inletkeeper, Homer, Alaska
Mavis Muller, aerial art facilitator
photo © ScottDickerson

To address this need, Inletkeeper has been working with partners across the Cook Inlet watershed—an area the size of the State of Virginia—to implement a Stream Temperature Monitoring Network in 48 non-glacial salmon streams. By monitoring stream temperatures, we can identify our "hot spots" and learn which valuable salmon streams are at greatest risk due to climate change; communities and resource managers will then be able to prioritize where to focus efforts to protect and restore salmon habitat.

But even in the face of rapid ecological change that could be devastating to our beloved salmon, Alaskans are still waffling on the need to make bold decisions about energy. Alaska possesses roughly half the known coal reserves in the United States, and as worldwide energy prices remain high, Asian markets and local power utilities are increasingly looking to Alaska coal resources for "cheap" and reliable energy supplies. Yet in a state feeling the disproportionate effects of climate change, expanded coal development represents a major step backwards in our quest for clean renewable energy, sustainable jobs and healthy salmon fisheries. The Chuitna Coal Project—a massive billion ton proposal along the shores of Cook Inlet just west of Anchorage—is the most imminent threat, and would set a dangerous precedent that would lock Alaska into a failed energy future replete with devastating habitat destruction, higher mercury levels in Alaska fish and more greenhouse gas emissions.

Cook Inletkeeper is tackling the climate change crisis and its impacts on our watershed by working with local partners, using science and honing our communication tools to help Alaskans understand the perils of coal and embrace a future that includes clean, renewable power and healthy salmon populations.

Cook Inletkeeper (AK), http://inletkeeper.org

Education, Collaboration and Community Action

Conversations that Matter: The Water & Energy Connection

by Eleanor McKenzie DelBene
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The Interfaith Environmental Initiative of Alabama (IEIA) is a community-based network connecting leadership of faith, science, business, environment, energy and water providers, education, and the arts sectors, to learn together and encourage and inspire informed choices for care of Creation. IEIA's three core values—education, collaboration and community action—are the foundation of our effectiveness. Together we are advancing connected initiatives for water and energy efficiency.

Education

Education—of ourselves, our colleagues, our networks, our constituent communities and consumers, is central to IEIA's work. From our beginnings in 2007 with a presentation by Harvard biologist Dr. E.O. Wilson and the *Watersheds and Warming Curriculum Guide*, workshop and retreat, our educational gatherings open up communication and collaboration. These and the following initiatives helped bring River Network's focus on the water-energy link into broader conversations.

In 2008, the Birmingham metro area's first conference on water efficiency, *Saving Our Water Symposium* (SOW), engaged water providers, low impact developers and new people from business and industry by inviting them to help plan the event and be presenters.

In 2009, the Water Working Group (WWG) emerged from the *IEIA Forum*. Current WWG partners include faith community leaders and executives from Alabama Power Company, Alabama Technology Network, Birmingham Water Works Board, Clarus Consulting Group, McWane, Inc., and environmental non-profits Alabama Environmental Council, Alabama Rivers Alliance and Cahaba River Society. Over many meetings, we learned about and from each other. Water utilities shared plans to meet water demands, and the Cahaba River Society and Alabama Rivers Alliance brought the water/energy and water efficiency/conservation /reuse perspective.

Through the IEIA approach, these organizations, which previously have not worked together, agreed on and collaborated to create *The Water and Energy Connection*, an educational PowerPoint developed to encourage conservation/efficiency/reuse initiatives by area high-volume water consumers, primarily business, industry and institutions.

In 2011 the IEIA Energy Efficiency Working Group emerged with a goal to find common purpose and be an "incubator" for ideas and guidelines that lead to specific actions in our businesses and organizations.

Collaboration

Our underlying *collaboration* principles are woven into our meetings and community actions. Collaboration requires ongoing education, coaching and practice and focuses on three key strategies:

1 Explore Interests, Not Positions

The planning process for *IEIA Energy Forum 2009: Challenges and Possibilities for Alabama* expanded our IEIA network to include executives from Alabama Power Company, Alabama Gas Corporation and the Alabama Public Service Commission; our keynote speaker was the EPA Region 4 Regional Administrator.

We made these connections through Clarus Consulting Group and other IEIA partners. Clarus helped facilitate some of our earliest, most sensitive planning meetings. Key to our success was including all partners in the forum planning. The questions we asked were crucial to the process. We named our interests, concerns and hopes for the future of Alabama. We asked ourselves: Whom will we invite/involve? What can we do jointly? Where are opportunities for success and to make a difference? These focus questions set the tone for conversation and event planning and also guide meetings of our working groups.

As described in *The World Café*: "The questions we ask and the way we construct them will focus us in a particular manner and will greatly affect the outcome of our inquiry. If we ask: What is wrong and who is to blame? We set up a certain dynamic of problem-solving and blame assigning. While there may be instances where such an approach is desirable…we have found it much more effective to ask people questions that invite the exploration of possibilities and to connect them with why they care."

With an unusually broad spectrum of participants in *Forum 2009* conversation, many "hot buttons" could have emerged. We were able to agree to focus on energy and water conservation and efficiency in Alabama, and new, productive conversations began.

2 Seek to Understand Others' Views Better than Your Own

As an outside consultant noted, "The beauty of your work is that it's not linear but collaborative. It's working because you are sitting around the table in conversation and creating the program as you go along." IEIA incorporates the following suggestions for improving our listening, as outlined in *The World Café*:

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- Help folks to notice that their tendency to plan their response to what is being said actually detracts from both the speaker and the listener.
- Listen as if each person was truly wise, and sharing some truth that you may have heard before but do not yet fully grasp.
- Listen with an openness to be influenced by the speaker.

In the Water Working Group, the Birmingham Water Works Board and two suburban water systems helped us explore their water demand and supply planning and the financial and implementation issues surrounding water efficiency. As one of the public utilities representatives noted, "This is so different! Usually when I am meeting with people around these issues, most of our time is spent arguing with each other and defending our decisions. Today we were actually having meaningful conversation."

3 Create Opportunities for Mutual Gain Wherever Possible

Several of our planning group participants wanted to give a *Forum 2009* presentation. A significant part of the planning process was agreeing on who would say what and how they would present their material in a way that would invite conversation, rather than positioning and debate.

During all of our Forums, presentations are followed by conversations with focus questions, encouraged by sitting at round tables. "People engage deeply when they feel they are contributing their thinking to questions that are important to them. As each person has the chance to connect in conversation, more of the intelligence inherent in the group becomes accessible …This cross-pollination of ideas often produces surprising results that could not have happened otherwise." (www.theworldcafe.com).

In the Water Working Group "success stories" have emerged that show the commitment and effective approaches already at work. For example, Alabama Power reduced water use in their corporate headquarters building equivalent to supplying 100 homes per year. The Water Board transitioned to off-peak pumping, resulting in $1 million in energy savings over less than 2 years. Many such success stories are in *The Water and Energy Connection* presentation.

Community Action & Stewardship of Creation

Our third value is community action and stewardship of Creation.

1 Energy/Water Efficiency in Faith Communities & at Home

Faith communities have networks that are already providing education for youth and adults and are ripe for environmental education and action. Our core leadership group includes Jewish and Baptist congregation leaders together with Presbyterian Presbytery, Episcopal Diocesan and United Methodist Conference environmental stewardship coordinators. Each person is organizing water and energy programs throughout their larger faith community, as well as in their individual congregation. The IEIA Faith & Home Working Group's June 2010 Forum brought together leadership from 20 Jewish and Christian faith congregations.

2 Water & Energy Efficiency: Business / Industry / Environment Collaborations

Based on concepts advanced by the World Wildlife Fund and River Network, the Water Working Group has chosen to strategically focus on high-volume water consumers. Our education initiative will catalyze productive plans for water savings and efficiencies that make the connections between water conservation/efficiency/reuse, energy efficiency and cost savings. Water Working Group members are committed to take this presentation to their peers in businesses, industries, large institutions and the landscape industry in the year ahead and to serve as a resource for their efficiency initiatives.

"The Interfaith Environmental Initiative of Alabama is one of the most unusual —and promising—collaborations in the Southeast. Communities of faith have tremendous convening power. In this case, IEIA is bringing together groups ranging from strong Alabama environmental organizations to commercial leaders such as Alabama Power and McWane Industries. This gives hope to anyone who believes that we can find common ground in our search for sustainable communities."

Dr. Stan Meiburg,
Deputy Regional Administrator of Region 4
U.S.Environmental Protection Agency

3 Promote an Ethic of Stewardship

An ethic of stewardship is foundational to IEIA and our Working Groups. Following are a few more stories developing out of IEIA initiatives:

- The energy utility is helping make the case within IEIA discussions that greater efficiency can make financial sense in the long term.
- Water utilities have expressed interest in learning more about Low Impact Development stormwater practices that recharge drinking water supplies.

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- Our collaborative relationships have facilitated more direct and open communication with EPA when environmental challenges surface. (EPA Region 4 Region Administrator was keynote speaker at *IEIA Forums 2009* and 2010).
- Those who participate frequently in meetings are talking more directly with each other, sharing and learning new information, and becoming more sensitive to the complexities of our issues and concerns.
- As an outcome of IEIA participation, Alabama Power is revising their website and publicity for a stronger and clearer focus on energy efficiency—including initiatives with water.
- Alabama Technology Network is incorporating information from the Water Working Group into their presentations to encourage improved sustainability practices by industries.

We find that the IEIA collaborative process for planning our events and initiatives is as important as the events and the measurable outcomes themselves. The planning allows us to explore common interests as we seek to agree on the aims and content of events and follow-up initiatives. This is building trust and collaborative success, which spills over to improve our working relationships on initiatives outside IEIA as well.

Forest & Watershed Climate Action in Rural Communities

by Hannah Murray
Model Forest Policy Program
www.mfpp.org

Despite the fact that two-thirds of the U.S. water supply sources from rural and forested communities, the critical role of U.S. forests and watersheds is often overlooked in efforts to incorporate climate solutions into local government planning processes. Climate Solutions University: Forest and Water Strategies (CSU) is designed to address this gap. CSU is an initiative of the Model Forest Policy Program (MFPP), in partnership with the Cumberland River Compact. MFPP is a national organization that advocates for forest policies and practices that restore and sustain healthy productive forests, clean and abundant water supplies and economically thriving climate-resilient communities. The CSU process helps rural communities design and implement climate adaptation plans that develop specific local land use policy and management practices at a variety of scales.

CSU is an outgrowth of two successful community planning processes that MFPP conducted in Tennessee and Idaho from 2007 to 2009. Both resulted in increased public engagement and customized policy changes to address climate planning and protect local watersheds and forests. MFPP subsequently partnered with the Cumberland River Compact to replicate the model in six communities in 2010, and an additional six communities in 2011. The original 10-month webinar-based curriculum and coaching program guides communities through a process to assess their climate risks and opportunities and implement policies and practices that protect forests and watersheds from climate impacts. These communities in turn serve as a model for future locally-led forest and water climate adaptation planning. Through analysis of the lessons learned from local natural resource

climate planning efforts, CSU aims to inform climate adaptation planning on regional, state and federal policy levels.

Challenges to Climate Adaptation Planning in Rural Communities

In rural counties, lower tax bases, smaller planning departments, conservative politics and a limited understanding of climate change serve as barriers to action to protect local ecosystems, resources and livelihoods. In CSU's experience with 14 communities to date, the most oft-cited needs are:

1 **Identifying and localizing climate data** and natural resource risks to the community level. Rural communities face the additional challenge of identifying ways to link effective local climate actions to the creation of regional adaptation strategies that can inform state and federal policy decisions and foster large-scale networks of healthy, connected natural resource corridors.

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2 **Resources** to complete the design and implementation of new land use policy, codes and ordinances. Many communities lack adequate time and resources to conduct the extensive preparation needed to identify locally-based risks and locally-appropriate climate adaptation strategies. Regional climate models may not be consistent with local conditions, and rural data related to local climate impacts is often scarce.

3 **Communication strategies** to build support among local decision-makers and the public.

4 **Communicating the science** about climate change—and the urgency of taking proactive measures to address projected impacts—has been another key challenge. Each CSU community has identified impacts that fit climate predictions that are happening now in their community. However, demonstrating causal linkages between climate shifts and impacts to natural resources (i.e., water, forests and habitat) has been difficult, as has been translation of known climate data and trends into an economic evaluation of impacts. Communities struggle to convey scientific and economic data in a way that motivates the public to take action and engages community leaders and decision-makers in proactive assessments and planning. Even in cases where the public sector has agreed on the need to strengthen policies, limited time and resources to implement the identified climate adaptation strategies have at times delayed the adoption of policy change at the local level.

Solutions

Despite these challenges, CSU communities have made tangible progress over the course of the program's first 18 months. Highlights include:

- **Utah**

  Participation in CSU helped the Canyonlands Watershed Council unite water and land management stakeholders in the Moab area to form the first multi-stakeholder watershed council in southeast Utah. With a defined climate action plan, the new council received funding to ensure its future climate adaptation planning activities. It is now under the oversight of the Utah Division of Water Quality.

- **Washington**

  The Nooksack Salmon Enhancement Association climate adaptation measures have been integrated into the regional salmon recovery plan and will have long-lasting benefits to those efforts. In addition, their outreach regarding the links between climate change and salmon and forest and water resources prompted local resource committees and watershed networks to address potential on-the-ground adaptation strategies for salmon recovery. Whatcom County partners agreed upon a plan to increase streambank buffer zones to prevent floods and protect water supply

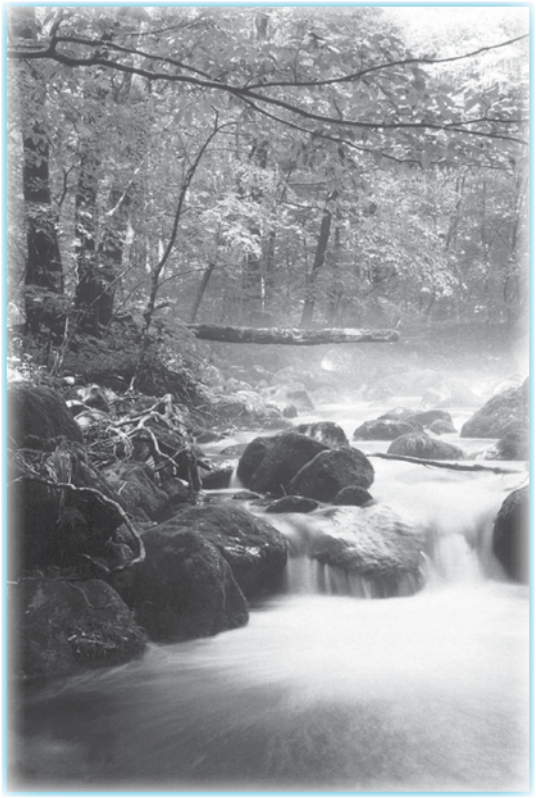
and endangered salmon. As a result of enrolling in CSU, the group received a grant from the EPA Environmental Justice Department to incorporate climate change into salmon habitat restoration projects, education and outreach.

- **Tennessee**

  The Sumner County (TN) Planning Department integrated climate adaptation measures into its natural resources section of the new comprehensive plan. Tangible short-term goals in the plan include increasing tree canopy county-wide and creating steep slope ordinances for water quality and flood prevention. In addition to being timely (the area was greatly affected by the Nashville floods of May 2010), this action demonstrated the potential for local government leadership on climate adaptation to facilitate protections for watershed health. CSU has found that working directly with local governments has been an efficient way to achieve on-the-ground change and looks forward to working with additional interested local governments in the future.

CSU & Watershed Groups

Watershed groups across the country are an important and growing constituency of CSU, comprising over half of the participating communities. They include representation from California, the Great Lakes, the Southwest, Southeast and Pacific Northwest; CSU's New England communities are also incorporating watershed considerations into their climate action plans. This geographic diversity has increased CSU's knowledge of regional planning needs and helped inform the field of locally-led climate planning.



CSU has found the watershed approach to climate adaptation planning to be a very effective way to organize efforts. In addition to benefiting local ecosystems, CSU has benefited communities by providing planning tools as well as a supportive network and partnership opportunities with other local and national organizations engaged in climate adaptation.

FOR MORE INFORMATION

To learn more about the training program, please visit www.mfpp.org. If you are interested in having your community participate, please contact Jeff Morris, CSU Community Coordinator at jeff@mfpp.org.

The Dirty Lie about Clean Coal

by Travis Leipzig
River Network
www.rivernetwork.org

A single power plant can withdraw up to 300 million gallons of water from local rivers and lakes each day. Thermoelectric power plants like coal-fired power plants nationwide account for 136,000 million gallons per day of freshwater, or 48 percent of total water withdrawals in the U.S.

Don't let yourself be fooled—there is nothing clean or cheap about coal fired power and there never will be. This is the basic underlying declaration in the new Waterkeeper Alliance Anti-Coal Campaign: The Dirty Lie. Taking what might be the first in-depth look at the vast environmental impacts of the entire lifecycle of coal power with the aim to "accelerate the phase out of coal from U.S. energy policy by exposing the problems associated with the use of coal as our primary energy source."

The Dirty Lie is a vital new lifeline in the fight against coal and the greater fight to establish clean, renewable sources of energy. From the pollution associated with coal extraction, the emissions and water consumption resulting from coal combustion and cooling, and the additional pollution and damage caused by the storage and spilling of coal ash waste, the entire lifecycle of coal-to-power is loaded with devastating threats to our environment.

Here are some of the eye opening and jaw dropping figures reported in The Dirty Lie Anti-Coal Campaign document:

- Coal-fired power plants emit 80 percent of the total greenhouse gases that result from electricity production.

- Whenever the U.S. brings a new coal-fired power plant online, it's like adding 600,000 cars to the road in terms of global warming.

When deciding on regulations and incentives that effect or stifle change in the U.S. energy industry, we must take the whole picture into account. The energy choices we make can have drastic effects on the environment we live in, the quality and quantity of freshwater that is available to us, and the health of creatures and organisms that are so pertinent to the natural cycle of all living things.

By choosing energy sources that don't dry-up or pollute the remainder of our national freshwater supplies as coal power and other thermoelectric fuels do, we can help ensure that clean water will be available in our country for generations to come.

And by choosing energy sources that don't emit massive amounts of carbon and other horribly detrimental pollutants into the atmosphere, we can prevent the acceleration of global warming.

More Dirty but True Facts about Coal:

- Coal-fired power plants generate 120 million tons of solid waste every year—enough to fill a million railroad cars, creating a train 9,600 miles long that would stretch between New York City and Los Angeles 3.5 times.
- The practice of mountain top removal of coal has razed an estimated 1 million acres of hardwood forests and decapitated 470 mountains, burying 1,200 miles of streams in just the past 20 years.
- Each year, U.S. coal-fired power plants also release 48 tons of the neurotoxin mercury in to the environment, polluting our waterways. As of 2006, there were 3,080 mercury fish consumption advisories across 14,177,175 lake acres and 882,963 river miles in the U.S. alone.

FOR MORE INFORMATION

- To become a partner with, support or simply learn more about the Waterkeeper Alliance and their new anti-coal campaign The Dirty Lie, visit www.Thedirtylie.com.
- To learn more about the unprecedented collision of water, energy and the climate, visit www.rivernetwork.org/programs/rivers-energy-climate.

Resources & References

REPORTS & PUBLICATIONS

20% Wind Energy by 2030, U.S. Department of Energy, examines challenges, impacts, needs and outcomes associated with wind development. www.20percentwind.org/20percent_wind_energy_report_revOct08.pdf

A Blueprint for Action is an excellent call-to-action paper prepared by the Alliance for Water Efficiency (AWE) and the American Council for an Energy-Efficient Economy (ACEEE). It provides a framework for collaborative efforts and a policy agenda for federal, state and local priorities integrating water and energy resources. www.allianceforwaterefficiency.org/blueprint.aspx

The Carbon Footprint of Water, River Network provides a baseline estimate of water-related energy use in the United States and numerous examples of how water management strategies can protect our freshwater resources while reducing energy and carbon emissions. www.rivernetwork.org/resource-library/carbon-footprint-water

A Clear Blue Future, NRDC provides an analysis of how Low Impact Development can increase water supplies and an effective way to mitigate global warming's impact on California. www.nrdc.org/water/lid

The Energy-Water Collision: 10 Things You Should Know, The Union of Concerned Scientists' provides summaries of the water impacts of energy choices—and ways to address them. www.ucsusa.org/assets/documents/clean_energy/10-Things.pdf

Every Drop Counts, Western Resource Advocates offers a range of values of water for use in electric resource planning while competing with domestic and agricultural water demands. www.westernresourceadvocates.org/everydropcounts/EveryDropCounts.pdf

Power Plant Cooling Water and Clean Water Act Section 316(b): The Need to Modernize U.S. Power Plants and Protect our Water Resources is a fact sheet on the immediate need for changes to U.S. EPA policies on water cooling towers to save water and aquatic resources. www.nrdc.org/water/files/powerplantcooling.pdf

The Ripple Effect: Water Risk in the Municipal Bond Market Ceres evaluates and ranks water scarcity risks for public water and power utilities in some of the country's most water-stressed region. www.ceres.org/resources/reports/water-bonds/view

Water Consumption of Energy Resource Extraction, Processing, and Conversion, Harvard University's Energy Technology Innovation Policy Research Group considers a life-cycle analysis of different energy technologies and their water use. http://belfercenter.ksg.harvard.edu/files/ETIP-DP-2010-15-final-4.pdf

The Water Footprint Assessment Manual provides a global framework to measure the water footprint of green, blue and grey water use at the individual process, individual product and consumption levels, as well as at business and national levels. www.waterfootprint.org/downloads/TheWaterFootprintAssessmentManual.pdf

CALCULATORS, MODELS & TOOLS

River Network's ***Water-Energy Toolkit*** contains 11 different tools and calculators designed to help river advocates, water managers and the general public to better understand the carbon footprint of their water use and benefits of water efficiency. www.rivernetwork.org/resource-library/water-energy-toolkit-understanding-carbon-footprint-your-water-use

UNC's Environmental Finance Center has recently developed a ***Dashboard for Capacity for Watershed Protection Investment*** tool that allows you to calculate the impact of rate changes on an average customer's bill, as well as the amount of money that can be generated for a dedicated watershed fund or specific project. www.efc.unc.edu/tools/WatershedProtectionRevenueDashboard.html

Pacific Institute offers several important tools including:

1. ***WECalc*** an interactive home Water-Energy-Climate Calculator that makes personalized recommendations to reduce all the impacts of water use. www.wecalc.org;
2. ***Urban Water to Air Model*** to help utilities quantify the energy requirements and associated air quality impacts of urban water management. www.pacinst.org/resources/water_to_air_models/index.htm; and
3. ***Agricultural Water to Air Model*** to help quantify the energy requirements and effects on air quality of agricultural water management decisions. www.pacinst.org/resources/water_to_air_models/index.htm

Alliance for Water Efficiency's **Water Conservation Tracking Tool** is available for free to members and evaluates the water savings, costs and benefits of proposed and actual conservation programs at the utility level. www.allianceforwaterefficiency.org/Tracking-Tool.aspx

The ***U.S. EPA's Water and Energy Savings Calculator*** is an ultra-simple calculator to estimate how much water and energy and utility money you can save by installing water efficient products in your home. www.epa.gov/watersense/calculate_your_water_savings.html

River Network Partnership

A Co-op of River & Watershed Organizations

WEBSITES & PROGRAMS

River Network offers an online newsletter, Saving Water, Saving Energy, blogs on the Water-Energy nexus and maintains a list of watershed groups interested in conservation, efficiency and climate. www.rivernetwork.org/programs/rivers-energy-and-climate

American Council for an Energy-Efficient Economy (ACEEE) is a nonprofit dedicated to the advancement of energy efficiency as a means of promoting economic prosperity, energy security and environmental protection. Their webpage links to important events, publications and information on state and federal policy. www.aceee.org/

CAKE (Climate Adaptation Knowledge Exchange) provides case studies, resource library and networking. This project of EcoAdapt offers a "slice of cake" monthly newsletter on adaptation topics. www.cakex.org

Circle of Blue provides a great introduction to the Water-Energy Nexus with a focus on the looming conflicts between water resources and energy production. www.circleofblue.org/waternews/2010/world/infographic-water-and-energy

ICLEI Local Governments for Sustainability works with local governments to generate political awareness of key themes by establishing plans of action to meet defined, concrete, measurable targets, implementation and evaluation. www.iclei.org

U.S. EPA WaterSense Program webpage has links to the various water-efficient products, information on National water use, the benefits of water efficiency and what you can do to help. www.epa.gov/WaterSense/index.html

Partnership Benefits

www.rivernetwork.org/programs/partnership-program

Organizational Strength

- One-on-One Assistance or Training
- Board of Directors & New Staff Resources
- Assistance Locating Experts
- River Network Grant Opportunities
- National River Rally

Electronic Resources

- Partner-only Webpages & Listserv
- Advertise Jobs & Events
- Post Your Wish List
- Webinars
- NOZA Database of Charitable Funding

Publications

- Printed/Bound Publications on Watershed Topics
- *River Voices* & *River Fundraising Alert* Journals

Product Discounts

- Insurance Discounts
- Global Water Monitoring Equipment
- Watergrass Database Design
- Grassroots Funding
- Promotive.com
- *Orion*
- Interactive Online Mapping Services

Sponsor a Partnership for a local group: if you know of an organization that needs financial assistance to become a River Network Partner, please complete this form and mail your check with the appropriate dues listed at left. River Network will contact the organization on your behalf with information on how to access all the great benefits described in this brochure—thank you!

Dawn DiFuria
Partnership Program Manager
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Fax: 503-241-9256

2011 Annual River Network Partner Dues

Nonprofit Organizations & Local, State & Tribal Government Partners	
Annual Budget	Annual Partner Dues
<$25,000	$150
$25,001-$100,000	$200
$100,001-$250,000	$275
$250,001-$500,000	$375
$500,001-$1,000,000	$500
$1,000,001-$2,000,000	$675
>$2,000,000	$900
Business & Consultant Partners	
Annual Gross Revenue	Annual Partner Dues
<$500,000	$500
>$1,000,000	$1,000

To renew, upgrade or join as a River Network Partner, please mail this form with your check to River Network (520 SW 6th Avenue, Suite 1130, Portland, OR 97204) or pay by credit card at www.rivernetwork.org/marketplace.

Contact Person _____

Org/Gov't/Business Name _____

Street Address _____

City, State, Zip _____

Phone (with area code) _____

Email (required) _____

Website (if applicable) _____

River Network
Connecting People, Saving Rivers
520 SW 6th Avenue, Suite 1130
Portland, OR 97204-1511

2012 Call for Workshop Proposals

for River Network's
13th Annual National River Rally
Portland, Oregon MAY 4-7

River Network is now accepting workshop proposals for the National River Rally, the most widely anticipated training opportunity for river conservation organizations and watershed partnerships in the nation. If you are interested in being a presenter at our 2012 River Rally, you must submit an online workshop proposal by Oct. 13, 2011.

www.rivernetwork.org/rally/call-for-workshops

Inspiration
Education
Celebration

www.rivernetwork.org/rally