



## THE FORUM

### The Emerging Water Crisis in the United States

**W**ater lubricates the American economy just as oil does,” says Robert Glennon, author of the new Island Press book *Unquenchable: American’s Water Crisis and What to Do About It*. It’s hard to argue with his premise. Just as with oil, supplies of water are finite and are coming under increased stress as population increases along with demand for water.

In May, ELI held an Associates Seminar to debate the premise of Glennon’s book and expand on his suggestions and findings. Afterwards, we asked the panelists plus one additional commentator to address a simple question that eschews a simple answer: What are the constraints on adequate, clean water resources for society’s varied uses, and what policy mechanisms are needed to address them in a hotter, more populous future?



**Robert Glennon**  
*Professor of Law*  
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*“We need the political will to address the crisis before it becomes a catastrophe.”*



**Mark Limbaugh**  
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*“Minimizing and resolving conflict is the key to managing finite water supplies to meet increasing demands.”*



**Nancy Stoner**  
*Co-Director, Water Program*  
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*“We can no longer afford the luxury of wasting water and ignoring hydrology.”*



**Reed Watson**  
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PROPERTY AND ENVIRONMENT  
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*“The crisis is easy to explain: It’s the lack of markets, for crying out loud!”*

## America's Water Crisis and What To Do About It

ROBERT GLENNON

**S**igns abound of the water crisis facing the United States, yet most citizens are oblivious to it. We're spoiled: turn on the tap and out comes a limitless quantity of high-quality water for less money than we pay for cell phone service or cable television. We think that water is like air, limitless and inexhaustible, but it's finite and exhaustible.

A healthy economy depends on fresh water not only for farmers and beverage suppliers but also for practically every business. Demand for water is outstripping supply, driven largely by relentless population growth, but also by companies such as Google and Intel, which need large quantities of water to run their server farms and produce microprocessors. And there is an important link between energy and water that has gone largely unnoticed. We may fret about running out of oil, but water is essential to energy production. In short, water lubricates the American economy just as oil does.

Where will we get the water needed to meet new demands? We have traditionally turned to engineering solutions: diverting rivers, building dams, and drilling wells. But with many rivers on life support, most dam sites already taken, and groundwater tables plummeting, business as usual is not an option. What other options are there? Some dreamers want to tow icebergs from British Columbia, build pipelines over the Rocky Mountains, or seed clouds. None of these options is viable.

Others think that the silver bullet lies in desalination. Solving the lament of the Ancient Mariner offers the prospect of a limitless supply of

potable water. But desalination faces three major hurdles. First, it's very expensive, requiring high-tech membranes that are prone to fouling and need frequent replacement. Second, it consumes gads of energy, which further drives up the price and itself requires more water. And, third, it generates a briny waste stream that must be disposed of. Still, desalination will be an option for some high-value uses. But it's not a panacea.

What else can we do? How about conservation? Some communities already have a culture of conservation but others are clueless. Modest conservation efforts can save significant quantities of water.

One major transformation would be to develop water-less methods for disposing of human waste. A century ago, Teddy Roosevelt said that "civilized people should be able to dispose of sewage in a better way than by putting it in the drinking water." But that's what we still do. Water treatment plants treat our sewer water to potable quality and send it back to our homes, where we use only ten percent of it for drinking and cooking. One-third of domestic water use goes down the toilet. It's a system that wastes both water and energy.

And it threatens human health. Scientists have recently learned that conventional treatment processes do not remove what the EPA calls "emerging contaminants," endocrine-disrupting compounds contained in hormone replacement drugs, birth control pills, and erectile-dysfunction medicines. It is long past time to heed Teddy's advice. Congress should establish a national commission to find sustainable solutions to the problem of human waste disposal.

Beyond these steps, we also need to use price signals and market forces to encourage conservation and reallocation. After protecting all citizens with a life-line rate for basic human needs, we need to price water appropriately by using increasing

block rates. And we need to halt the tragedy of the commons of allowing limitless access to a finite resource.

By recognizing that existing water users have rights to specific quantities of water and by making these rights transferable, we can insist — finally — that growth pay its own way. Any new user, whether it's Google or a housing developer, should be required to offset this new demand on the common supply by persuading an existing user to reduce her use by an equal amount. The government has an important role in overseeing this water market to protect both third parties and the environment from harm.

What will happen to American farmers if cities and developers go around buying up their water rights? Nothing, as it turns out. Over the last 25 years, water transfers have moved roughly twice the annual flow of the Colorado River out of farming into municipal, industrial, and environmental uses. Yet, aggregate farm income has not declined. That's because farmers have responded as savvy businessmen to an opportunity. When given the ability to conserve water and sell the saved water to developers, farmers have installed more efficient irrigation systems, taken poorly yielding lands out of production, or changed the crop mix, moving, say, from alfalfa production to almond trees.

The water crisis is real but we have options for confronting it. Now, we need the political will to address the crisis before it becomes a catastrophe.

**Robert Glennon** is a Professor of Law at the University of Arizona. His new book is "Unquenchable: America's Water Crisis and What To Do About It," published by Island Press.

## Minimizing and Resolving Conflict Is the Key

MARK LIMBAUGH

**W**ater is a key component of life itself, but unlike the air we breathe, our fresh water supply is finite. It may even be diminishing, according to many in the scientific community, because of pollution, watershed degradation, and climate change.

Yet, the demand for fresh water is increasing worldwide. Population growth and expanding urban and industrial development are placing unprecedented pressures on existing supplies. In the United States, human water needs must compete with the fresh water demands of legally protected aquatic species, while water managers struggle to maintain an aging water storage and delivery infrastructure starved for resources. These elements have combined to make conflict an inevitable component and consequence of virtually all contemporary water resource management decisionmaking. Conflict drives policymakers toward crisis management and short-term fixes while squandering resources that could be devoted to long-term planning and lasting solutions.

Minimizing and resolving conflict is the key to effectively managing finite water supplies to meet ever-increasing demands.

Any strategy to remove conflict from water management decisionmaking must include three basic components: conservation and markets, science and technology, and infrastructure investment. These three components must be incentivized, supported, and implemented through the development and application of consistent public water policies and financial tools at the local, state, tribal, and federal levels. And,

for any of these basic components to be effective, they must respect and rely upon the foundation of our water management systems of today: state and tribal water laws, interstate compacts, court decrees, and tribal and international treaties.

Conservation is a very cost-effective way to manage and stretch existing water supplies to meet new or expanding needs. Conservation can be attained through application of new water management technologies, through changes in individual habits, and through improved management. All of these efforts require a substantial investment of time and money. Water markets are currently not well developed, but states and tribes could embrace the voluntary transfer of water from one user to another in a "market-like" environment, while preventing or mitigating unintended impacts to third parties. This would result in a collaborative and non-confrontational approach to moving water to meet the challenges of future hydrologic uncertainty and changing societal values and conditions.

Recognizing the impacts of the uncertainties of climate change and global warming on our watersheds, we must invest in next-generation data collection and computer models to predict and inform water managers of climatic impacts to our individual watersheds. Impacts ranging from changes in runoff patterns and timing, to the type of precipitation (rain vs. snow) at low to medium altitudes, to increases in evaporation/sublimation rates have been predicted. Water managers also need information in real time to better control and manage the resource. A "smart" water grid could apply today's powerful computer and sensor technology, informing water managers through the mining of different data sources (such as weather reports, evapotranspiration rates, or fishery and environmental information) and connecting real-time monitoring equipment with automated or supervisory controlled water management infrastructure.

All uses of water would be accounted for and the outcomes/performance would be measured. Water supply optimization would become an important layer of management parameters used in meeting competing needs for fresh water.

Some say we cannot engineer our way out of water crises anymore, but adequately investing in water development and improving our water management and delivery systems must be a major component of any serious effort to meet significant increases in demand for fresh water. Engineered solutions to the water problems of the future will be dramatically different than those of the past. We must think differently in order to manage the water supply challenges we will face. Meeting environmental demands while protecting other important water uses, such as irrigated agriculture and industry, will require developing additional water storage, management of both surface and groundwater conjunctively, application of tools to better manage water supplies, and investment in more efficient and reliable water delivery systems.

We must continue to improve the way we use, manage, and invest in our water resources, placing a higher value on fresh water supplies than we have in the past. We need water policies that encourage partnerships, promote accountability, and optimize water management. Yet, water policies that do not recognize and respect state, tribal, and local laws and agreements, that create conflict instead of collaboration, and produce only winners and losers will be ineffective. Tomorrow's successful leaders will avert divisiveness and conflict in water management, engage in proactive watershed planning, and apply innovative tools to meet water supply challenges.

**Mark Limbaugh** is a Partner in The Ferguson Group, LLC, and is a former Assistant Secretary for Water and Science at the U.S. Department of the Interior.

## America's Water Future: There's a Better Way

NANCY STONER

**T**he basic problem facing U.S. water resources in the 21st century was identified by Benjamin Franklin. "When the well is dry, we know the worth of water." Unfortunately, when the well is dry, we appear only to be able to focus on how to replenish it, not on how to ensure that supplies will last.

Evidence of the inadequacies of our current policies is everywhere — from falling groundwater levels and decreasing stream flows, polluted lakes and streams, loss of wetlands and headwaters, growth of dead zones, tumor-riddled fish, beach closings, etc.

The sources of these problems are numerous, but many are linked to the three major water infrastructure systems we have: water, wastewater, and stormwater. As Dr. Glennon states in *Unquenchable*, we use only 10 percent of tap water for drinking and bathing. Except for the small amount of water needed for potable uses, the delivery and treatment of ever increasing supplies wastes energy, chemicals, and money. Why do we pay the sewer authority to treat the used water when we could use it to water the plants, wash the clothes, or flush the toilets?

Scarce resources are wasted through designs that transport wastewater long distances for treatment and by once-and-done treatment processes that discharge treated waters into streams to be carried out to sea instead of using it for irrigation, cooling, and other non-potable needs.

The stormwater system may be the worst of all. It is designed primarily to get rainwater off the surface of the land as fast as possible

and put it in pipes where it goes untreated into the waterways. So, not only are we throwing it away instead of putting it back in the ground where it can replenish aquifers and feed streams, but we are also using it to efficiently transport and dump all the trash, fertilizer, pesticides, automotive fluids, pet waste, and other refuse from our streets and yards into lakes and streams. The pipes also carry such high volume, high velocity flows after storms that they scour the streambanks, obliterating habitat.

These are not new systems or new problems. It is the way we have been designing our infrastructure for decades, but we can no longer afford the luxury of wasting water and ignoring hydrology. Abundant, safe water resources are essential to a healthy U.S. economy. Beach going contributes up to \$30 billion annually to the U.S. economy and recreational fishing contributes between \$10 and \$26 billion.

Climate change is exacerbating the stresses on water resources. From urban and agricultural water supplies to flood management and protecting aquatic ecosystems, all aspects of water resource management are being affected. Rising temperatures, loss of snowpack, escalating size and frequency of flood events, increasingly frequent droughts, and sea level rise are just some of the impacts on the management of water resources. Facing elevating temperatures, increasing evaporation rates and extending dry seasons, even existing rainfall patterns will yield less in terms of real water supplies. Global warming is also predicted to increase the frequency and intensity of storms. However, intense rain events often deliver too much water at once, causing it to run off. These effects, likely in combination, will decrease water supplies throughout most of the country.

To assure secure and clean water supplies and healthy ecosystems, we need to redesign the nation's infra-

structure around significantly more efficient and sustainable practices. Reducing greenhouse gas emissions is essential, and the water sector can be part of any solution by reducing energy use through water conservation and efficiency, rain-water harvesting, and groundwater recharge through practices such as low impact development. Actions to improve water quality and supplies, protect aquatic ecosystems, and improve flood management not only make sense, but early action will also help reduce future impacts. The key is to look for new practices that will address multiple stressors simultaneously. Most of those synergistic solutions involve one or more of the following: preservation or use of trees, vegetation, wetlands, and other green infrastructure approaches to protect or restore natural hydrology; capture and reuse of water instead of throwing it away; and on-site solutions that put water back in the ground and avoid costs associated with treatment or disposal.

In California, NRDC has identified a "virtual river" of new water supplies from clean, environmentally sound water management approaches, such as water recycling, water efficiency, capturing rainwater through green infrastructure, cleaning up contaminated groundwater basins, and expanding groundwater storage. Water efficiency can help assure safe and reliable drinking water supplies, reduce energy use and greenhouse gas emissions, reduce pollution, protect our rivers, save consumers and businesses money, and help us build a stronger economy.

**Nancy Stoner** is Co-Director of the Water Program at the Natural Resources Defense Council.

## The Solution: Water Markets to the Rescue

REED WATSON

America's water crisis is simple to explain: it's the lack of markets for crying out loud! Why don't we have a shoe crisis, a coffee crisis, or a computer crisis? It's because markets for those goods discipline the behavior of consumers and suppliers. Consumers don't purchase shoes, coffee, or computers unless they place a value on those goods that's higher than the price tag — the market price. In turn, suppliers won't sell those goods unless the market price is higher than the supplier's costs; that is, unless selling is profitable.

In the case of water, however, there is no market discipline on either consumers or suppliers. Even though water is "the new oil," it is "cheaper than dirt" for most consumers because government subsidies artificially reduce the price, in some instances by a factor of ten. Imagine how many computers would be demanded by consumers if government subsidies reduced the price below \$100. The same point holds for water. Whether it is urbanites with lush gardens in Phoenix or farmers who grow rice in California's Central Valley, water subsidies and water conservation simply don't mix.

Market discipline is similarly lacking for water suppliers. Take federal water projects as the prime example. Taxpayer funding allows the Bureau of Reclamation to ignore profits and losses and deliver irrigation water at costs that exceed the value of the crops irrigated. As development continues in cities already experiencing water shortage, the bureau's indifference towards water prices and profits will only exacerbate the impending water crisis.

Using markets to get the water price right would help reduce water waste, as an example from the beer industry illustrates. Anheuser Busch's plant in Los Angeles covers 95 acres and produces 12 million barrels of beer, which requires 40 million barrels of water annually. When water costs rose to equal labor costs, however, the company sought ways to conserve. Among other initiatives, the plant began collecting steam from the brewing process and using it to clean equipment. The result has been a 30 percent reduction in water use; and it was the rising price of water that motivated these more efficient water practices.

Getting the price of water right, however, is not simply a matter of government agencies increasing water prices. The price must come from active water markets.

Consider California, where an ongoing drought threatens municipal water supplies. The state's Drought Water Bank could mitigate the problem by allowing irrigators in the Central Valley to sell water to thirsty municipalities in the south. Unfortunately, the state rather than the market will determine the transfer price. If the state sets the price too high or too low, few trades will occur; a price too high will ensure excess supply and too low excess demand. Letting willing buyers and sellers determine the water price would ensure the state's dwindling water supplies go where they are needed most.

Even environmentalists rely on markets to mitigate water shortages, proving that Adam Smith's invisible hand has a green thumb. Between 1997 and 2007, environmental groups and government agencies spent an estimated \$530 million to acquire approximately 10 million acre-feet of in-stream flows. Markets allow environmentalists to contract with irrigators for water, turning capitalists into conservationists and conservationists into capitalists.

In addition to quantity, water

quality must also be brought into the marketplace if we are to solve the water crisis. Experiments with nutrient trading permits in the mid-Atlantic and mid-West are showing that markets can reduce nonpoint sources of pollution. Outright contracting works too. Des Moines, Iowa, is paying upstream farmers to adopt land use practices that reduce nutrient run-off, a strategy that saves the city millions in water treatment costs and one that is replicable elsewhere.

For decades America has faced a water crisis but done little more than pay lip service to the problem. Consumers are ordered to water their lawns on odd-even days, Congress passes laws requiring low-flow showerheads and toilets, farmers and cities call for more storage reservoirs, and all the while, government agencies subsidize water consumption.

To solve America's water crisis, we must establish clear water rights and allow the owners of those rights to trade. Doing so will prime the invisible pump of markets as means of ending the water crisis. Only markets can balance consumer demands with scarce water supplies and end the crisis once and for all.

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