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America's Water Crisis and What to Do About It

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Robert Glennon's expertise is in water law and policy. He serves as a water policy adviser to Pima County, Ariz., to the American Rivers' Science and Technical Advisory Committee and as a commentator and analyst on television and radio. He is the author of "Water Follies: Groundwater Pumping and the Fate of American Fresh Water" published in 2002, and "Unquenchable: America's Water Crisis and What To Do About It," published in 2009.

"We Americans are spoiled. Turn on the tap and out comes a limitless supply of high-quality water for less money than we pay for cell phone service or for cable television. We think of water as though it were like air, infinite and inexhaustible, when, in fact, water is very finite and very exhaustible. The United States is now facing a water crisis," Robert Glennon said.



Robert Glennon

"How can water be exhausted when water cannot be created or destroyed?" he asked. His answer: Some uses preclude the use of water by future generations. Every time a toilet is flushed in Los Angeles, as much as six gallons of water ends up in the Pacific Ocean. That water is not destroyed, but it is no longer where it's needed, when it's needed and in the form it's needed.

Components of the U.S. water crisis. A major component of the water crisis is that (in some areas), the demand for water is completely out of proportion with the supply. The city of Las Vegas personifies this situation. CityCenter is one of Las Vegas' latest developments. Costing \$9.1 billion, it is the largest privately financed construction project in American history and includes six or seven towers from 37 to 61 stories tall.

The problem is that Las Vegas is running out of water. Patricia Mulroy, director of the Las Vegas Water Authority, has to scramble for water. To get water for the city she has offered to build a desalination plant on the Pacific Ocean for the cities of Tijuana, Mexico, and San Diego in exchange for some of their share of Colorado River water, which Las Vegas could access through Lake Mead. A \$3 billion, 150- to 200-mile pipeline also will be built in central Nevada to pump groundwater and move it south to Las Vegas. Mulroy also is paying people in Las Vegas as much as \$2 dollars per square foot to remove their lawns and has aired public service announcements encouraging water conservation. How can she justify the expense of these projects? Las Vegas' strip is the economic driver of the entire state but only consumes 3 percent of the total water used in the state. Agriculture is responsible for 80 percent of the water used in Nevada but produces only 6,000 jobs, the same number of jobs as an average-sized Las Vegas casino. Glennon said for Mulroy, it is a simple matter of dollars and cents.

Water shortages. Other places also face water shortages. Since 2007 farmers in Colorado have had their wells turned off in deference to senior appropriators. The small community of Orme, Tenn., ran out of water and had to truck in water. Scripps Institution scientists predict Lake Mead, the water supply for Phoenix, Las Vegas and Los Angeles, may go dry by 2021. A small paper company in South Carolina closed its doors, laying off several hundred workers because there was not enough water in the river to discharge the plant's waste flows. The Nuclear Regulatory Commission has denied two permits for power plants in Georgia, and three other states have denied permits for coal-fired power plants because there was not enough water to run them. The largest of the Great Lakes is too low to float fully-loaded cargo ships. The commercial fishing season off the coast of the Pacific states has been cancelled for two years in a row. In Riverside County, Calif., a score of commercial and residential projects were cancelled because of a shortage of water to support them. About two years ago, the city of Atlanta came within 90 days of having its principal water supply, Lake Lanier, dry up. These crises were not caused by concerns about endangered species or other environmental values. "It's about economics. Water lubricates the American economy just as oil does," Glennon said.



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Response to water shortages. "Ben Franklin said that 'when the well's dry, we will know the worth of water.' But he was wrong because we are running out, and we're paying no attention to it," Glennon said. How did Atlanta respond to the drought? The city imposed some modest water restrictions and conservation requirements – no water for swimming pools, car washing or watering the lawn. The governor called for a prayer vigil on the Capitol steps. The state legislature passed a resolution proclaiming that the border set in 1818 between Georgia and Tennessee was erroneously located and should be moved one mile to the north, allowing Georgia access to the water in the Tennessee River. What Georgia has not done is restrict new uses of water. Anyone in Georgia is free to make a diversion from a river or to drill a well, if no more than 100,000 gallons of water per day will be pumped.

The problem is not drought but population growth. Scientists tell us there is nothing special about the recent droughts in Georgia or California. The elephant in the room is population growth. California has 4.9 million more residents than during the drought of the late 1980s and the early 1990s. The U.S. population has grown to more than 300 million and is predicted to be 420 million by mid-century. Where will the water come from to serve this population?

Ethanol demand on water. Other demands for water also are increasing. According to Glennon, even a modern ethanol plant that recycles water requires four or more gallons of water to refine one gallon of ethanol. A modest-sized plant producing 50 million gallons of ethanol annually needs 200 million gallons of water. To grow enough corn to refine one gallon of ethanol may take an additional 1,700 to 2,500 gallons of water, Glennon said. Yet the California Legislature still decided the state should produce a billion gallons of ethanol a year by 2022. Meeting that goal would require every drop of water that now passes through the San Joaquin Sacramento Delta and provides water to 7 million acres of the nation's most productive farmland and water for southern California cities. While it takes a lot of water to produce energy, it also takes a lot of energy to move, treat, transport and pump water. In California, 19 percent of all energy use is for the movement and treatment of water. There is a very close connection between water and energy use.

“*The burden of development is being put on those who want to place new demands on the resource. This is a new way of thinking about our water supply.*”

Technology requires water. Another rather surprising increase in the demand for water, Glennon said, comes from high tech industries. One and a half percent of all the electricity in the U.S. is now used for the servers powering the Internet, and that figure is expected to double within the next 18 months. Water often is used to dissipate the heat generated by electricity use. An example is Google’s giant server farm, a windowless concrete building that houses thousands of linked computers, all generating heat and cooled by water.

Engineering solutions are no longer viable. In the U.S., engineering solutions are the common answers to water shortages: divert more water from rivers, build more dams and drill more groundwater wells. But according to Glennon, those options are no longer viable, with very few exceptions. The consequences of groundwater pumping can be dramatic, causing land subsidence and rivers to run dry. Glennon described an area in his home state of Massachusetts that gets more rain than Seattle, yet the Ipswich River has been completely dry for the last five of eight years due to groundwater pumping.

“Desalination is an option, according to Glennon, but not for low-value purposes. Desalination is expensive, consumes a lot of energy, and the brine removed from the water must be disposed of safely. Reusing municipal effluent is another possibility. In Tucson, Ariz., recycled water is used on golf courses, highway medians, turf facilities and cemeteries. Water conservation and water harvesting also show promise.

The American toilet. Glennon said his pet peeve is the use of the American toilet to dispose of human waste. In the American system, water comes out of the treatment plant and is sent to homes for drinking, cooking, landscaping and flushing the toilet. Only 10 percent is used for drinking and cooking, but Americans spend \$50 billion a year treating all water to a drinking water standard. One-third of all indoor use of this water is for toilets. He stressed the need to consider alternatives such as waterless composing toilets.

Valuing water as a commodity

Glennon said making use of price signals and market forces to drive water reallocation is a tool that should be used in the U.S., but hasn’t. “We don’t pay anything for water. I mean that literally. What we’re paying for is the cost of the service,” he said. As an example, Glennon described the reaction of irrigators in Nebraska in 2003 when the Nebraska Public Power District decided to increase the rates it charges farmers to \$3 per acre-foot. There was a storm of protest. Three dollars an acre-foot is equivalent to paying one penny for 1,080 gallons of water. That is how little we value water, Glennon said.

How can we use market signals to reallocate water? Before using market signals to reallocate water, society first needs to recognize humans’ right to water, Glennon said. Sandra Postel and Peter Glick have estimated that people use between seven to 15 gallons per person each day. For the 300 million people in the U.S., this is 1 percent of the total water used in the country. That amount should be taken off the table and reserved for domestic uses. For the remaining water consumption, Glennon advocated promoting water conservation by establishing increasing block rates that are seasonably adjusted.

Glennon provided the example of a steel plant built by the U.S. government during World War II as another way to assess the value of water. According to Glennon, the government sold the plant to Geneva Steel after the war. By the end of the 20th century,

Geneva needed to liquidate its assets and sold the land, which was prime developable land just outside of Provo, Utah, for \$46 million. The plant itself was sold to a Chinese company for \$40 million and the iron ore mine for \$10 million. Because Geneva was no longer producing steel and polluting the air, the company had pollution reduction emission credits that sold for another \$4 million. The total revenue from these sales was \$101 million. Then Geneva sold the water rights. The water rights were worth more than the other assets combined.

“How did these water rights become so valuable?” Glennon asked. It happened because Jerry Olds, Utah’s state engineer, said the state would not issue permits for groundwater wells for subdivisions unless developers have sufficient water rights to support the project. Olds is not halting development; he is saying that development must pay its own way. The burden of development is being put on those who want to place new demands on the resource. This is a new way of thinking about our water supply, Glennon said. Allowing unlimited numbers of permits epitomizes the tragedy of the commons because it incentivizes everyone to use as much of the resource as quickly as they can before someone else does, he said. In Utah, that cycle is being broken.

Water transfers. Glennon described a study of water transfers in the western U.S. that he and two economists had recently completed. According to the study, water transfers are not going from industry to industry, but are going from farm to non-farm uses. Because 80 percent of water use is by agriculture, most water transfers come from agriculture. Remarkably, although 31 million acre-feet of water have been transferred out of agriculture, agricultural income has been constant. The absence of decrease in farm income, according to Glennon, is because farmers are savvy business people. Faced with an opportunity to make money by selling water rights, they will make adjustments to maintain production. They may use sprinklers rather than flood irrigation systems; they may take the 40 acres with clay soil and low productivity out of production; or they may change their crop mix.

An example is lettuce farming in Arizona, Glennon said. It takes about 20 workers most of a day to harvest a field of iceberg lettuce with traditional methods. In Yuma, Ariz., a farmer decided to grow baby lettuce. The baby lettuce is harvested with a vehicle comparable to a giant electric razor. When the truck is finished harvesting, the farmer drives a tractor down the field and applies some fertilizer. There is no need for pesticides because the plants are so close together. The roots are already there and the crop comes back and the cycle is repeated. Farmers are finding value-added ways to make as much or more money with less water.

To encourage reallocation of water, Glennon said, people cannot have limitless access to a finite resource. Government must consider using price signals and market forces to encourage the reallocation of water, he said.

“In the end I am optimistic because this is a crisis, not a catastrophe,” Glennon said. “We have options to avoid a catastrophe, but we need both the understanding that there is a crisis out there and the will and the moral courage to act upon it.”



Dry irrigation canal