

Water Justice: Water for All, or Just Us? by Debra Shore  
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Good morning. I want to thank the program committee, especially co-chairs Jeannie Herbert and Debbie Ross and president Fran Beatty for inviting me to join you today and to share some thoughts about water. In the course of my remarks, I'm going to present two concepts, three questions, and one stirring conclusion.

You know, Water was here before us and, in all likelihood, water will be here after us. But we could not be here at all without water. Of the three essential ingredients in the recipe for life on Earth, the first and foremost is liquid water.

As geneticist and philosopher David Suzuki has noted,

“Water enters our bodies, circulates through it to the rhythm of the heart, ceaselessly carrying food, fuel, and cellular and molecular detritus to and from various organs of the body. Water seeps through our skin, escapes from our lungs as vapour and exits every opening in the body. It then reenters the hydrologic cycle, trickling into the soil, entering plants, evaporating into the atmosphere, entering bodies of water. In this way, water circulates endlessly from the heavens to the oceans and land, held briefly within all living things before continuing the cycle. You might see the whole enterprise of life as just a vehicle for the transformation of water. ”

Indeed, we ourselves are water vessels.

Up to 60 percent of the human body is water by weight, the brain is composed of 70 percent water, and the lungs are nearly 90 percent water. About 83 percent of our blood is water -- indeed you could say that blue blood applies to all of us --- which helps digest our food, transport waste, and control body temperature. Each day humans must replace about 2/3 of a gallon of water, some through drinking and the rest taken by the body from the foods we eat.

A couple of years ago Michael Specter wrote an article in *The New Yorker* called “The Last Drop” and in it he noted that the amount of water on Earth has not changed significantly for

millions of years. “Water that dinosaurs drank is still consumed by humans. But that doesn’t mean it’s available when or where it is needed. Nearly all of the earth’s water is in the ocean. Only three per cent is even theoretically available for humans to drink. Most of that is locked in polar ice caps and glaciers, or deeply embedded in layers of rock. If a large bucket were to represent all the seawater on the planet, and a coffee cup the amount of freshwater frozen in glaciers, only a teaspoon would remain for us to drink.”

Yes we live on a blue planet – most of the Earth when seen from space is covered with water. But what humans (and most other species) need is water that is fresh and clean and most of the Earth’s water is salty and dirty.

So while the amount of water on Earth is finite, and it is part of a global cycle, we have been taking clean water and making it dirty. As a result, it takes more energy – largely from fossil fuels – to remove pollutants from water so that we can use it or to separate salt from water so we can drink it.

Let me share some sobering water facts:  
More than one-third of Africa’s population currently lacks access to safe drinking water. Of the 25 countries in the world whose people have the least access to safe, clean water, 19 are in Africa. *The Atlas of African Lakes* produced by the UN Environmental Program in October 2005 showed unprecedented deterioration in all of Africa’s 677 major lakes. Lake Chad has shrunk by almost 90 percent.

The Aral Sea in Central Asia, once the world’s fourth-largest inland body of water, has shrunk by more than 75 percent and may soon be altogether lifeless.

China has less water than Canada and 40 times more people. The water table beneath Beijing has fallen nearly 200 feet in the past 20 years. Drought-related sandstorms and desertification create a new desert the size of Rhode Island in China every year.

In 2004 the Sri Lankan bureau of the International Water Management Institute conducted a global survey on the

practice of irrigation with sewage water. It found that one-tenth of the world's irrigated crops – lettuce, tomatoes, mangoes, coconuts – is watered by sewage, most of it completely untreated – added directly to fields complete with disease-causing pathogens and industrial toxins. In some Third World cities, all food sold is grown in sewage. Aren't you glad I am telling you this before lunch?

The first of the concepts I want to touch upon today is the concept of virtual water. Virtual water is the amount of water that is embedded in food or other products needed for its production.

So, for instance, it takes 1300 gallons of water to produce one hamburger. This is the water required to grow the crops to feed the cow that produces the beef for the hamburger.

It takes 221 gallons of water to produce one pot of coffee; 450 gallons to produce one pound of rice; 660 gallons for one piece of cheese; 1190 gallons to produce a steak. 66 gallons for a glass of wine; 1,000 gallons for a quart of milk and 2,800 gallons for a pair of blue jeans.

When countries import food they are also importing the water embodied in the crops. Every ton of wheat arriving at a dockside carries with it, in virtual form, the thousand tons of water needed to grow it.

The United States exports about a third of all the water it withdraws from the natural environment. Other countries do as well: Canada exports its water in the form of grain, Argentina in the form of beef, Thailand in the form of rice. And Australia in the form of grains, cotton, sugar and much else. Indeed Australia, the world's driest continent, has for some years been the largest net exporter of virtual water.

What this means is that some countries will have to stop exporting their water in the form of food. Does it really make sense for Israel and other arid countries to grow and export tomatoes and citrus fruits to Europe and beyond taking precious water out of the local hydrologic cycle?

Although water is part of a global system, how it is used and managed locally and regionally is what really counts. While we care about water shortages and water pollution in Africa and India, those don't really affect us here. Lucky us, we sit next to nearly 20 percent of the world's fresh surface water in the Great Lakes. We have plenty, right?  
Not exactly.

Decisions made and engineering projects undertaken more than a century ago shape our water use and define our region.

Chicago is the city in a garden, for sure, but it is also the city that reversed a river – and from that endeavor, all else flows.

So, let's take a look at water in the Chicago area. As Joel Greenburg has noted in his *Natural History of the Chicago Region*, “The force of the glacier ordained that the Chicago region would straddle the eastern Continental Divide, separating the drainage area of the Atlantic Ocean from that of the Gulf of Mexico. The Des Plaines River, the Fox River, the Kankakee River and their tributaries lie in the Illinois and Mississippi watershed. The Chicago River and the Calumet flowed into the Great Lakes.”

Chicago in the 1860s and 70s was teeming with people, bustling with activity. Industry was booming. The Union Stockyards opened in 1865. People dumped human and animal waste and all manner of garbage directly into the river, which flowed into Lake Michigan. While industry and the city grew, public health was deteriorating. Water-borne illnesses like cholera, typhoid fever and dysentery caused many deaths.

At the same time, Chicago was building its first public water supply system... with intakes near the shoreline – no treatment (not until 1930's).

Increasing concerns about public health led to the establishment of the Chicago Sanitary District in 1889 charged with protecting the drinking water supply for city residents.

It's been said that all problems started out as solutions. The solution to the problem of Chicago's contaminated drinking water was to construct two major channels to direct the flow of the Chicago River into the Des Plaines and divert wastes away from Lake Michigan. The Sanitary District dug the 28-mile Sanitary and Ship Canal between 1889 and 1900. Locks located near Lake Michigan and at Lockport diverted the flow of the North Branch of the Chicago River, the South Branch, and the Main Stem into the canal and then on to the Des Plaines River. The completion of the 8-mile North Shore Channel in 1910 connected Lake Michigan at Wilmette Harbor with the North Branch of the Chicago River allowing us to use lake water to flush sewage from the northern suburbs downstream. Put another way, the solution to pollution was dilution.

In 1922 the 16-mile Cal-Sag Channel was constructed between Blue Island and Sag Bridge to link the Little Calumet River to the Sanitary and Ship Canal.

Mind you, these massive engineering projects were essentially open sewage pipes built to convey human and animal waste and all manner of garbage downstream. They were manmade channels dug where no waterways had existed previously.

Through human agency – our energy, capital and invention – we reversed a mighty river. By the 1920s more modern processes of sewage treatment had been developed and the Sanitary District began to build sewage treatment plants in Cook County so we no longer dump raw sewage into the rivers. Now we send our human waste to seven wastewater treatment plants that have the capacity to treat a billion and a half gallons of residential and industrial waste water a day serving the equivalent of 10 million people. Today 70 percent of the flow in the Chicago waterways is from the discharge of treated wastewater -- the effluent -- coming from the District's treatment plants.

Environmentalist Roland Clement has said, "Our whole society was built on the notion that we could and must control nature, that we must master our circumstances, technologically. But natural systems are the consequence of a

long evolution, and ecology is teaching us that we must first understand these systems to see how far we may modify them for our benefit without disastrous consequences. This is a new point of view that arose with ecological science, that world systems have a functional reality of their own and that if we push them too far, the systems will either break down or backfire.”

By reversing the Chicago River we created two new problems: First, we made a conduit between Lake Michigan and the Mississippi River that did not exist in nature, so that today we are spending millions of dollars to try to prevent invasive species, especially the Asian carp, from traveling up the Mississippi and Illinois Rivers and entering the Great Lakes, where it is likely they will decimate the sport fishery.

And we broke the natural hydrologic cycle, changing the shape of the Lake Michigan watershed and creating what is known as the Chicago diversion. Today we take close to a billion gallons of water a day from Lake Michigan for residential and industrial use and we return almost none of it. And all the rain that falls on the landscape east of the continental divide still flows into the Chicago River and its tributaries, but now that flow no longer replenishes the lake. It ends up in the Gulf of Mexico.

SLIDE -- This narrow strip is what remains inside the Lake Michigan watershed in Illinois today.

We take water – this precious liquid asset – out of the lake, we essentially use it once, and then we throw it away. No wonder we call it waste water.

I ask you, How smart is that? How smart is it to treat the substance on which all life depends as if it were garbage? So the first question of water justice that I pose to you today is this: What do we owe the lake?

You may have read about a program in Orange County, California called Toilet to Tap that is daily transforming 70 million gallons of treated sewage into drinking water for 2.3 million residents by running it through an advanced filtration system, and then pumping the reclaimed water into the county’s underground aquifer to reduce saltwater intrusion and supplement drinking water supplies for county residents.

In San Antonio, one of the largest customers for their wastewater effluent is Toyota, which uses it in a manufacturing plant. Here we throw it away.

Let's look at some of the changes on the landscape and what they mean for water. Today approximately 42 percent of Cook County is impervious surface – we have paved and built and covered over the land. So it's not surprising that in a heavy rainstorm, water has no place to go.

I live in a fairly modest home in Skokie and here's what's happening on my block. Older homes built in the 1950s are being torn down or renovated and expanded. Smaller homes are being replaced with larger homes. The increase in impervious surface means more runoff, less capacity for the land to absorb rainfall. This one new home will produce 50,000 more gallons of runoff a year, stormwater that will surge into the same 10-inch pipe laid down the middle of the street half a century ago. And there are four tear-downs on this street alone, so there will be perhaps 200,000 more gallons of stormwater pushing into the same size pipe during rainstorms over the course of a year.

Pipes as you know can only hold so much water, so when there is more water than a pipe can hold, it either backs up into someone's basement, or overflows elsewhere.

Here are several images showing the build-out in suburban Des Plaines, which has experienced severe flooding and which is today 48 percent impervious surface.

This is where I live, a fairly modest home with a rather large asphalt driveway. My partner and I calculated that if we ripped up the asphalt and replaced it with gravel or some other permeable surface, it would save between 9 and 10,000 gallons a year, that today runs into the street where it collects salt and oil, then drains into the sewer where it gets contaminated, we pay to treat it, and then we send it to the Gulf of Mexico. So I wanted to show what 10,000 gallons a year might look like if we could capture it on site and recharge our aquifer with that rain water.

You might ask, What can we do? How do we peel back some of the concrete skin – OUCH! -- we have laid over the land? How can we restore the land's ability to capture rain and recharge our underground aquifers?

One way is by employing a suite of techniques called green infrastructure. Rain barrels to capture rain from your roof which you can then use to water your plants or lawn, bioswales which are essentially vegetated ditches that capture rain and allow it to evaporate, green roofs to slow the flow of rainwater into sewers and cool buildings in cities.

More than 12 and a half million gallons a year runs off the Field Museum's roof and terraces – and into the sewers. What if we could capture that rain and send it coursing through a 21<sup>st</sup> century aqueduct back to the lake?

Why is it important to capture rain where it falls through these various techniques? Chicago and 50 of our older suburbs have what are called combined sewer systems, which means the same pipes carrying waste from your homes and mine also carry rainwater flowing down street drains. So if we can keep rainwater out of our sewers, we can keep that relatively fresh source of water from becoming contaminated and it will recharge our underground water supply. If we reduce the amount of stormwater flowing to our wastewater treatment plants, it will save energy at the plants and allow that grey infrastructure a longer life. Second, when we can use rainwater to irrigate our gardens and lawns, we reduce the amount of filtered drinking water used for that purpose, also saving energy and keeping that water in the natural hydrologic cycle. So there are numerous good reasons to do this.

Capturing rain and conserving water are two pillars of sustainable water use. Did you know that in Chicago there are 2,600 miles of pipe that are 60 years old or older? And there is a leakage rate for older pipe – 3,000 gallons per mile per day. So through unavoidable leakage and unaccounted for flow, Chicago is losing 65 million gallons a day. That's water that has been pumped from the lake, treated at the filtration plant, and sent out into the system but that is not getting to

your faucet! That's enough water, at current usage rates, to supply nearly 700,000 people.

This brings me to the second concept I wanted to share with you and that is the notion of the energy embedded in water. When we lose water through leaky pipes, not only is that water lost for beneficial use, but we have wasted the energy it took to pump and treat that water, to produce the chemicals used to treat it. Whenever we waste water, we are also wasting energy.

It is estimated that England's water companies lose 30 percent of their water to leakage. In poorer countries losses run from 40 to 60 percent. So one of the biggest things Chicago and other cities can do to conserve water is to repair and replace leaky pipes.

The modern water cycle has embedded energy use in every step: pumping to filter and treat water, to distribute it, to treat wastewater and recycle it, and to heat water in your home before you use it. To highlight this point, consider that California's water cycle uses 19 percent of the state's electric energy load and 32 percent of the natural gas energy load.

Let me turn to the second question of water justice and that is, What do we owe the rest of nature?

Consider the Hines emerald dragonfly:

This is a species that is rare on this earth – it is found in only four states including Door County, Wisconsin and the Des Plaines River Valley in northeastern Illinois. This exquisite creature is utterly dependent on high quality wetland ecosystems in which groundwater seeps through dolomite limestone and emerges from bluffs and rivulets in places such as Lockport Prairie in Will County. According to studies, the population of the Hines emerald dragonfly at Lockport Prairie has the greatest genetic diversity of any remaining population.

The Hines emerald dragonfly needs freshwater to live and reproduce. Yet studies at Lockport Prairie showed that the area was getting drier; the seeps which were always

intermittent, sometimes flowing and sometimes dry, were flowing for much shorter periods and at less-frequent intervals. Based on 8 years of monitoring, the average water level has dropped in excess of one foot. Water is being pumped out of the aquifer faster than it is recharging.

It turns out that a nearby golf course owned by Lockport Township had pumps at two wells, one shallow and one deep, that course managers used to fill the irrigation ponds. Each time the golf course drew on the shallow well, the study monitors showed a very pronounced drop in the aquifer. When the staff at the Lockport Township Park District learned this, they agreed to stop using the shallow well. But the nearby village of Crest Hill has been growing and has begun withdrawing water from three additional new wells sunk into the dolomite aquifer.

Now a number of groups are seeking to protect the groundwater recharge area by dedicating up to 700 acres of State-owned land adjacent to Stateville Prison as open space for storm water infiltration and public recreation.

But without regulatory oversight or government control, there will be no protections for the natural world. Maude Barlow has noted that the commodification of water is really the commodification of nature. If water is accessible only to those who can pay for it, who will buy it for nature? Who will stand up for the Hines emerald dragonfly at the zoning board meetings when new developments that will put more pressure on limited water supplies come up for approval? We are the proxy votes for nature.

Through conservation, stewardship, and life cycle pricing strategies, we can make sure we have enough water for us, but will there be enough just for us?

This leads me to the third question of water justice: what do we owe the river?

One hundred and twenty years ago, in part because it was the cheapest alternative, we reversed a river and saved a city. We dug miles of canals to convey sewage downstream and to carry barge traffic on inland waterways to a bustling city. No one ever imagined that one day people would canoe

or kayak on these waterways; no one envisioned that these open sewer pipes could become part of a vibrant metropolis for the 21<sup>st</sup> century, that the number of fish species would increase, that endangered black-crowned night herons would make a home here, that people would no longer turn their backs to the water but see it as an amenity and an attraction. The river has been called the artery running through the heart of the city. Do we have the vision, the will, and the wherewithal to clean up this urban working river, making it safer for recreation, healthier and more beautiful? This is not a simple question. It will cost a lot of money. And yet, are we not diminished as a people if we continue to treat our water as a waste product and our rivers as a garbage dump?

You and I here today are enormously lucky – through the accident of birth or the exercise of volition, we live near and have access to one of the world's great natural resources. As such, it is incumbent upon us to demonstrate wise stewardship of this precious, irreplaceable liquid asset, our fresh water. Enjoy it, play in it and protect it. Use it sparingly. Treasure it. And let us consider, together, our shared responsibility to it.

Can we craft a future that meets human needs and those of the rest of nature? Can we demonstrate the restraint, respect and, yes, love, necessary to provide for the Hines emerald dragonfly as well as Mr. and Mrs. Hines and their offspring?

Let me close with three words: Yes we can.