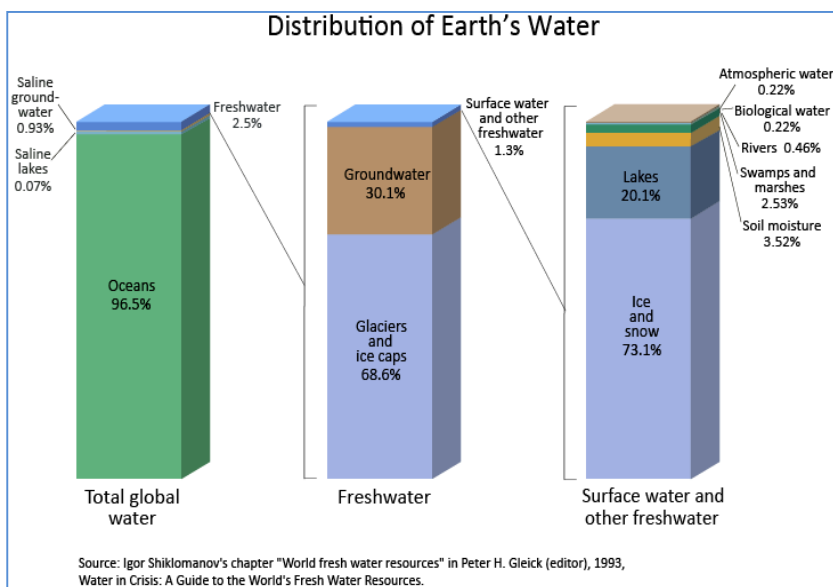


Dovetail Commentary: Water, water, everywhere and only a drop to drink

Hello from the land of 10,000 lakes! Well, actually Minnesota has 11,842 lakes with a surface area greater than 10 acres (40,000 square meters)... including the BIG one – Lake Superior, which, at 20,365,000 acres, is the largest surface area of fresh water on earth.¹ To some extent we thought this made us relative experts on the topic of water, so this month we have an article on stormwater management and next month we will have an article on watersheds, both issues that should be near and dear to all our hearts. Water is such an important topic we thought we'd do a brief refresher here as a prep for those articles.

Fresh water is critical to the survival of terrestrial life on this planet. The survival process is pretty simple – at its heart we simply need air, water, and food. Without air, we survive only minutes. Without water, hours or perhaps days; and without food, we would survive only a few weeks. Luckily, the earth provides these things in abundance and somewhat proportional to those needs – although the distribution is inconsistent. The limiting factor today and for the near future appears to be water. The pressure exerted on global water supplies is multi-faceted as we consume water directly but also indirectly through virtually all our food supplies.



Where is the fresh water?

As most people realize at this point, the earth contains a lot of water... about 332 million cubic miles (1.385 billion cubic kilometers) of it as a best guess. Of this amount it is estimated that over 96 percent is saline. The good news is that we can consume plants and animals from saline environments and get both the nutrition and moisture we need in the process. The bad news is we can't get sufficient moisture in this manner. Thus, we must rely on fresh water for

this purpose.

The chart above shows the breakdown of fresh water on earth. Approximately 68 percent of fresh water is tied up in glaciers and ice caps. Not only are these waters physically and generally economically unavailable, but they also are linked to concerns of salinization over the next century (i.e. they are melting and many of those gallons are moving from the freshwater category into the ocean and saline category!). Another 30 percent of fresh water is in the ground and accessible only with use of greater technology and investment. Thus even though about 1 percent of fresh water is surface water (a small amount in its own right) only a much smaller percentage (less than 3/10^{ths} of one percent of freshwater) is readily available from rivers and lakes; the most common source of water for people around the globe today. As we suggested earlier, this water is not evenly distributed relative to the human population.

¹ Source: www.lakehomes.com/lakestats-mn.html

We humans consume a lot of water, and we also transport it constantly around the world, thus complicating local water use patterns and distribution. For example, the state of California, notoriously short of water, exported almost 1.6 million tons of leaf lettuce out of their agricultural regions (dominantly from three counties) in 2009.² Lettuce is about 96 percent water, which means California exported over 1.5 million tons (or approximately 363 million gallons) of water. All this water from California does help hydrate people around the world, but it does little to recycle water directly to the source from which it came.

Although lettuce is extreme in its proportion of water, it is not unique. All fruits and vegetables are predominantly water. Cabbage is 92 percent, carrots are 87 percent, potatoes are 79 percent, blueberries and apples are 85 percent, a grapefruit is 91 percent and even a banana is 74 percent.³ So, every time we ship food around the country, or world, we are shipping our water resource with it. Overall, the odds that it gets recycled back its source eventually are pretty good...but that eventuality could be a really long time in coming. Relying on weather patterns for your next drink can be an iffy matter.

As another note, the global human population weighs about 316 million tons.⁴ At about 66 percent water this means that about 75 billion gallons of water are tied up in the 7 billion humans on earth today, and the population is growing in both numbers and in girth. For every billion added to the population we tie up over 10 billion gallons of water or roughly equivalent to a 1000-acre lake that averages 30 feet deep (or a lake greater in size than 98 percent of the 11,842 in Minnesota)!

The point here is that water resources are critical to our survival and the ways we depend upon and impact water are complex. Humans are moving a lot of water around and it isn't all in pipes. Developing a better understanding of how we manage and recycle moisture within population regions is critical to the economic provision of water for future generations. We look forward to continuing to explore the topic of water, including this month's discussion of stormwater management in urban areas.

- Jeff Howe, Ph.D.
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² Source: California Agricultural Resource Directory 2010 (Sacramento: California Department of Food and Agriculture, 2010)

³ www.livestrong.com/article/350652-percentage-of-water-in-fruits-vegetables/

⁴ Rettner, Rachael. 2012. The weight of the world: Researchers Weigh the human population. My Health News Daily, June 18, 2012.