

We never know the worth of water till the well is dry.

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Although the oceans cover about 70% of Earth's surface, humankind is very dependent upon the tiny portion of water that is fresh. One billion people are already water stressed globally, and changing patterns of precipitation result in both droughts and floods.

Globally, rivers and streams are being drained due to human use and climate change. These and other human impacts alter the natural variability of river flows. Some impacted rivers have dried and no longer run, while others have actually seen increases in the variability of flows due to storm floods. The end result is that these two forces are conspiring to shorten flood chains, particularly by eliminating top predators like many large-bodied fish (Sabo et al. 2010).

In the United States, the mighty Colorado River, which carved the magnificent Grand Canyon, fails to reach the Pacific Ocean for much of the year. How could such a situation have happened?

Then, beginning in the 1920s, Western states began divvying up the Colorado's water, building dams and diverting the flow hundreds of miles, to Los Angeles, San Diego, Phoenix and other fast-growing cities. The river now serves 30 million people in seven U.S. states and Mexico, with 70 percent or more of its water siphoned off to irrigate 3.5 million acres of cropland (Zielinski 2010).

The human population is still growing, and little attention has been given to the ecological needs of the aquatic organisms that inhabit the river or the birds and other terrestrial animals and plants that depend upon it.

What humankind is ignoring is that the biota dependent upon the Colorado River is a component of the biospheric life support system that has maintained conditions favorable to *Homo sapiens* for the entire time the species has been on Earth. Of the five prior biospheres, none has resulted in conditions favorable to the genus *Homo*. The sixth biosphere is already in the midst of a great species extinction which, if continued, will almost certainly result in a seventh biosphere that is unlikely to produce conditions as favorable to humankind as the present biosphere. Why is nurturing the present biosphere so low on the list of political priorities?

Freshwater shortages are also worsened by events on land: "The soils in large areas of the Southern Hemisphere, including major portions of Australia, Africa and South America, have been drying up in the past decade, a group of researchers conclude in the first major study to ever examine 'evapotranspiration' on a global basis" (Jung et al. 2010). Since water in freshwater ecosystems comes mostly from land, this problem is serious.

Contamination of freshwater by runoff from land and industrial and municipal waste discharges is also a major problem. One recently discovered hazard is insecticides from genetically modified

corn found in adjacent streams (Tank et al. 2010). Corn is engineered to release an insecticide that wards off the European corn borer, but these insecticidal proteins do not stay put, which puts more than the corn borer at risk. Almost certainly, insects will evolve immunity to this particular pesticide, but many long-life cycle organisms, including humans, will still be at risk. Preliminary scientific tests would have identified the probability of these pesticides leaching into the larger environment, and, if they did, more extensive confirmatory tests would be appropriate. Production of hazardous materials requires civic responsibility from both the producer and the regulatory agencies.

Most major resources upon which both humans and their economy depend are diminishing rapidly. A recent World Wildlife Report indicates that : “If business continues as usual, . . . humanity will be using resources and land at the rate of two planets each year by 2030, and just over 2.8 planets each year by 2050” (Barringer 2010). How can a species designated wise (*sapiens*) perpetrate such action on populations of all species now alive and on posterity? I have yet to hear a satisfactory answer.

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LITERATURE CITED

- Barringer, F. 2010. The human as Bigfoot. 13 Oct New York Times
<http://green.blogs.nytimes.com/2010/10/13/ecologically-an-overdrawn-bank-account/>.
- Jung, M., M. Reichstein, P. Ciais and 30 additional authors. 2010. A recent decline in the global land evapotranspiration trend due to limited moisture supply. *Nature* 467:951–954.
- Sabo, J. L., J. C. Finlay, T. Kennedy and D. M. Post. 2010. The role of discharge variation in scaling of drainage area and food chain length in rivers. 14 Oct *Science* DOI: 10.1126/science.1196005. <http://www.sciencemag.org/cgi/content/abstract/science.1196005>.
- Tank, J. L., E. J. Rosi-Marshall, T. V. Royer and 4 additional authors. 2010. Occurrence of maize detritus and a transgenic insecticidal protein (Cry1Ab) within the stream network of an agricultural landscape. 27Sept *Proceedings of National Academy of Sciences*
<http://www.pnas.org/content/early/2010/09/22/1006925107.full.pdf+html>.
- Zielinski, S. 2010. The Colorado River runs dry. October, *Smithsonian Magazine*
<http://www.smithsonianmag.com/science-nature/The-Colorado-River-Runs-Dry.html>.