



## **Balancing Human and Environmental Needs with Increasingly Scarce Water Resources**

**Mark Smith**

**Director, Eastern U.S. Freshwater Program,  
The Nature Conservancy, Boston, MA**



**By Christopher Krupenye '11**

With increasing water scarcity and limited preventative planning for the future, it can seem quite difficult to manage water to provide sufficient supply to all people in an area of concern. Given that these people as well as agriculture and industry hold a perceived priority far greater than that of the local environments from which the water is removed, the future of nearly all ecosystems could be at risk. For the long-term survival of ecosystems and a clean and safe water supply, it is essential that the needs of both human populations and the environment are considered in managing water resources. Mark Smith's presentation, "Balancing Human and Environmental Needs with Increasingly Scarce Water Resources," detailed current international policies as well as relevant science and goes further to make suggestions for future water management.

Mark Smith began his presentation describing current United States water management policies that affect the entire country. The first policy he addressed was the U.S. Clean Water Act, which was put into effect in 1972 and has been amended several times since. According to Smith, the Clean Water Act states that all water within the United States should be both fishable and swimmable. Although the act has been in place for 35 years, this is a great feat and is still a working goal. Even though the act has not yet been fulfilled, the intention to complete it is progressive as compared with past ideologies where ecosystems were not considered during development.

Next he moved on to an example of possibly the most progressive water law anywhere in the world, that of South Africa and its National Water Law of 1998. The purpose of the water law is to establish a standard that the country must meet basic human needs of all people in South Africa. The law promotes equitable access to water for all communities, ethnic groups, and individuals. Because South Africa had recently come out of Apartheid, there was a great concern for providing equal opportunity to all citizens and equal access to all resources. This has led to the progressive nature of the water law. The most progressive aspect is the emphasis placed on protecting aquatic systems and securing ecologically sustainable development. The importance placed on this part of the law is easily understood when considering the circumstances of the country. Much of South Africa is rural and many people's livelihoods are maintained by living off the land and the natural ecosystems. Their survival is intimately linked with that of their environment. Because of this dependence on subsistence ecosystems, it is essential that the environment is healthy and protected. Again, this is backed by the desire to maintain equal opportunity for all South African people.

Returning to the United States, Smith discussed Florida's water policies, which are among the strongest in our country. Florida intends to make sufficient water available for human use while avoiding adverse effects which generally result from competition for water supplies. This means creating equal opportunity for water resources while maintaining a healthy environment. In order

to do so, the state has implemented minimum flow levels for rivers so that ecological sustainability is enforced. It has also eliminated domestic wastewater ocean outfalls. These outfalls dispense wastewater from industry into the ocean, which affects the local ecosystem. Shutting down the outfalls protects coastal ecosystems by reducing disturbance from the wastewater.

Next Smith discussed the Montana House Bill 0831. The bill says that the state “shall offset net depletion through a mitigation plan or an aquifer recharge plan.” The bill is important because it is making an effort to maintain healthy water resources and to implement preventative measures so that issues of water scarcity will not suddenly become a devastating problem for the state.

Michigan also has a progressive plan for water management. According to Smith, Michigan’s intention is that there should be “no individual or cumulative adverse resource impacts.” This means that the state is calling for a sustainable approach to resource management. Steps must be taken to replace that which is used. Among these adverse resource impacts are fish populations. Michigan has specifically stated that resource use cannot “result in a 3% or more reduction in density of thriving fish populations.” This is a solid commitment to biodiversity and ecosystem preservation. This water law is important because it forces those who would use the resources to consider the effect that they will have on the environment as well as how the resources can be replenished. This places a greater stress on reduction of use and conservation of resources as the first consideration. Next one must consider the obligation of maintaining the current level of the resource and in order to do so must plan for the replenishment of those resources that they use.

After detailing water management policy, Smith addressed the science involved. First he explained the biological gradient, which is a curve plotting the influence of environmental stress on the degradation of an ecosystem. Several categories are set up, which are used to classify each ecosystem. The curve is important because it specifically links the level of stress to the degradation of the ecosystem. It can be used to both predict and measure degradation. There is also an ecological classification of rivers, which is defined for every river or stream. Next he explained the flow-fish response curve, which compares the health of fish populations to the depth of the river. This curve can also be used to make predictions about how a change in river level will affect fish populations. These curves are all used to determine acceptable changes to aquatic environments.

After addressing science, Smith enlightened the audience on some aspects of our personal water footprint. Specifically he mentioned that it takes nineteen gallons of water to make one glass of beer and eighteen hundred and forty gallons of water to make a pound of beef. He further elaborated noting that it takes considerably more resources including water to produce animal related foods than plant foods. These are just several examples of commonly used products and their water consumption. Most people do not even begin to think about how much water goes into frequently consumed goods such as these. Smith also addressed the point that moving towards a more plant based diet will allow us to better conserve water resources through reduced use.

Finally Smith discussed water stewardship needs and our water future. He called for an independent, effective international water law and governance of water resources. He also

mentioned the importance of a verification process to protect water resources and of establishing principles involved with water use and protection. In terms of our water future, Smith said that we need to use all of our strengths and resources to navigate water scarcity keeping in mind humans and the environment. He spoke of using “tools, technology, and smarts.” We must ask the right questions, maintain the right objectives, utilize the right tools, and make the right decisions for our water future. It is obvious that we have a formidable task in front of us in order to balance human needs while considering the environment and future sustainability of water resources, but what this means is that we must take preventative measures and begin immediately to secure our water future.

**Resources provided by Richard Hederstrom '09:**

The Nature Conservancy Water Initiative: <http://www.nature.org/initiatives/freshwater/>

Water Environment Federation: [www.wef.org](http://www.wef.org)

Water and Environment Journal

U.S. EPA Water Laws: [www.epa.gov/water/laws.html](http://www.epa.gov/water/laws.html)

Water Encyclopedia: [www.waterencyclopedia.com](http://www.waterencyclopedia.com)

UN and FAO Water Law and Standards: <http://www.waterlawandstandards.org>

Alliance for Water Stewardship: [www.allianceforwaterstewardship.org](http://www.allianceforwaterstewardship.org)

USGS Water Use in the United States: <http://water.usgs.gov/watuse/>

Water Footprint: [www.waterfootprint.org](http://www.waterfootprint.org)

Water Policy (Official Journal of the World Water Council): [www.iwaponline.com/wp/toc.htm](http://www.iwaponline.com/wp/toc.htm)

Rosgen, DL et al. 1985. A stream classification system. [www.csa.com](http://www.csa.com)

Rosgen. 2006. *Field guide for stream classification*. Wildland Hydrology, Pagosa Springs, CO.

Juracek, KE et al. 2003. Limitations and implications of stream classification 1. *Journal of the American Water Resources Association* 39(3): 659-670.