EarthTrends: Featured Topic

Title: Giving Nature Its Share: Reserving Water for Ecosystems
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Source: *Putting the Water Requirements of Freshwater Ecosystems into the Global Picture of Water Resources Assessment*
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Modern assessments of water focus largely on the availability of water for unrestricted human use, but have yet to explicitly consider the environmental needs of the aquatic ecosystems. In order to provide for the sustainable utilization of water resources, such assessments must determine the extent to which a river's flow can be altered from its natural condition, while still maintaining the integrity or an acceptable level of degradation of the eco system. Worldwide recognition of this need has produced the concept of "environmental flows" or "environmental water requirements."

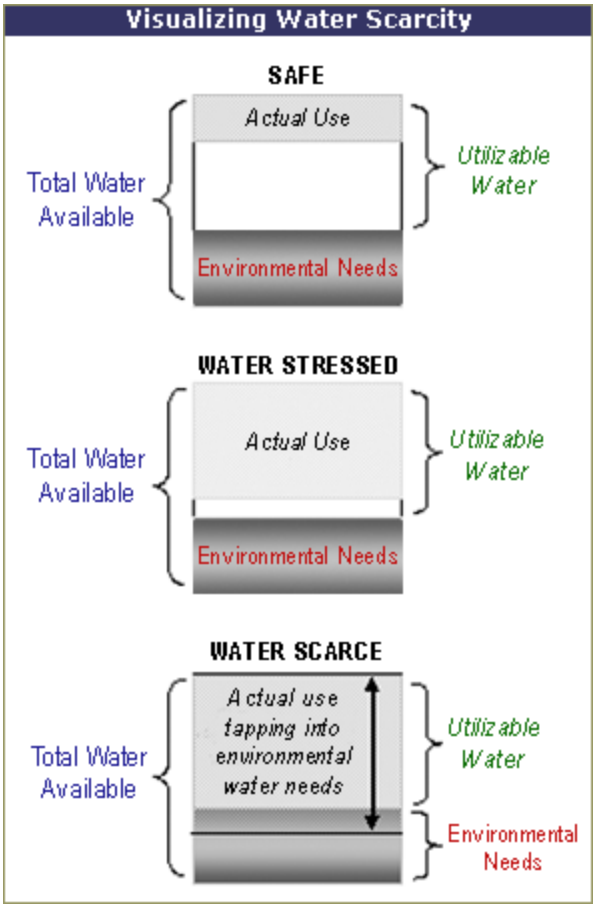
Environmental water requirements are defined as the quality and quantity of water required by an aquatic ecosystem for the protection and maintenance of its structure, functioning, and dependent species. If ecosystems are to sustain the crucial water-related goods and services humans depend upon to survive, a certain amount of water must be reserved for them.

The Needs of Aquatic Ecosystems

Freshwater ecosystems and their associated coastal areas need maintained water regimes to support their plant and animal communities and ecological processes. A water regime is the prevailing pattern of water flow for that system, over a given time. Some rivers have a naturally constant flow of water with higher seasonal floods.

Intermittent rivers in arid areas, on the other hand, do not have a constant flow, but rather periods of high peak flows. Native species are accustomed to and rely on these flow patterns for their survival. Determining environmental water requirements for an ecosystem involves identifying those aspects of the natural water regime that are most important for sustaining its key ecosystem features and processes, then ascertaining the minimum quantity of water needed to sustain them.

Unfortunately, population growth, industrialization, and the expansion of irrigated agriculture have increased demand for many water-related goods and services, straining the capacity of freshwater ecosystems. These phenomena make water scarcity a top priority for many countries. Ideally, only the excess water in the system–the amount of water above and beyond what the ecosystem requires to maintain its ecological processes and dependent species–should be taken for agricultural, domestic, or industrial uses. However, in reality, this is rarely the case. Observing environmental demands will guide wise resource use by providing specific target benchmarks for water withdrawals.



The Global Picture

The study of environmental water requirements of aquatic ecosystems is a rapidly developing field. Current methods for estimating environmental water requirements differ in input information requirements, types of designated ecosystems, time required for application, and the level of confidence in the final estimates. They range from hydrological methods, largely data-driven, to multidisciplinary models, involving expert

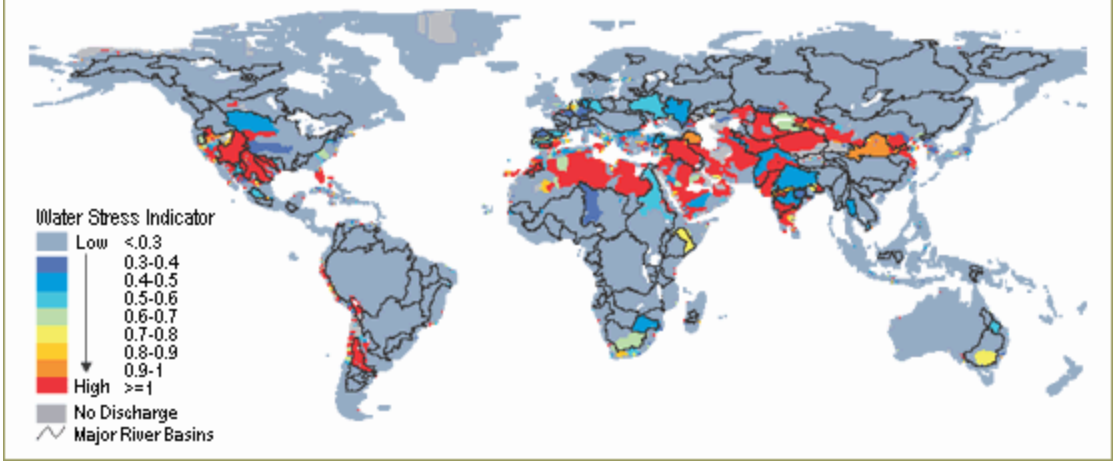
panel discussions and ecological information.

As a rule, ecosystem water requirements are case-specific, and must be carried out at the scale of individual river basins.

Preliminary results of the study portray a bleak picture of the condition of the world's river basins. In many parts of the world, humans are tapping into water that is needed to sustain healthy ecosystems, damaging the livelihoods of fishers and local communities. Incorporating environmental requirements into water assessments highlights long-ignored, yet vital, aspects of water scarcity. This new information shows the world's water resources to be in a much more troubling state than originally assumed.

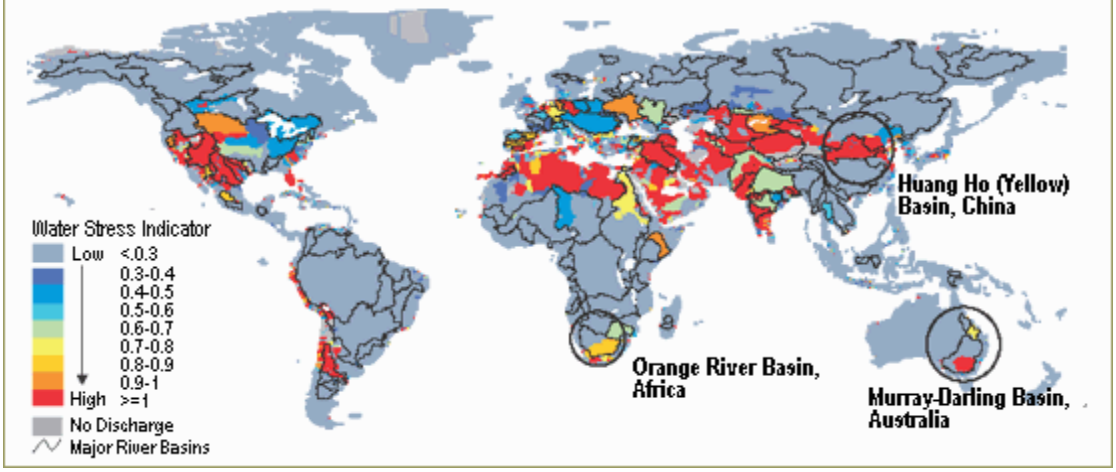
Water Scarcity: The Traditional View

Figure 2: Human Water Stress by River Basin
Water Use as a Proportion of Total Water Availability



Taking Environmental Water Requirements Into Account

Figure 3: Human Infringement on Environmental Water Demand
Water Withdrawal as a Proportion of Water Available for Human Use



The top map (Fig. 2) represents the traditional method in which water scarcity is assessed. It compares water withdrawal to water availability without taking into account the environmental needs of aquatic systems. This is the approach used in most current water resources assessment models and scenarios. The following map (Fig. 3) measures the proportion of water withdrawal with respect to water available to human use, where the portion of the basin's water that is estimated to constitute an environmental water requirement is not open for human use. A comparison of the two maps shows that when the ecosystem's water requirements are taking into account, more basins have a high degree of water stress. In addition, the circles in Fig. 3 identify perfect examples of basins where excessive extraction of water is causing problems to the ecosystem and to the people that depend on the environmental services that the ecosystem provides.

In an effort to gauge the general state of the world's water resources situation, however, a global model of water availability that takes ecosystem requirements into account was developed by the International Water Management Institute, the World Resources Institute, the Center for Environmental Systems Research, and the World Conservation Union in 2003.

The Future of Environmental Water Requirements

A few countries, including Australia, the United States, and South Africa, possess a solid track record of applying different water assessment methodologies. Sadly, they make up the exception rather

than the rule. Most nations, even those privileged with considerable financial and technical resources, lack the information necessary to determine or even estimate environmental water requirements. The aforementioned global model relies exclusively on hydrological data and simple conceptual rules, but ideally, basin-level environmental requirements should also factor in water quality, biodiversity, runoff, drought conditions, the desired future state of a basin, and differences in availability of water during different seasons of the year. The scarcity of such data makes the obstacle of measuring environmental water requirements an even greater challenge.

Fortunately, a few ongoing freshwater assessments and initiatives currently focus on improving access to basin-level data, as well as information on freshwater ecosystem goods, services and resources. Firmly establishing accurate environmental water requirements would necessitate the collection and analysis of local and/or regional information in the context of variable flows. This would allow for a better understanding and quantification of hydrology; realistic management targets for different ecosystems, basins, and regions; and the proper evaluation of trade-offs. It is envisaged that information generated through such initiatives will reinforce the case for environmental water requirements and provide insights into their development.

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