JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION
Vol. 45, No. 5 AMERICAN WATER RESOURCES ASSOCIATION October 2009

INTRODUCTION: FEATURED COLLECTION ON INSTREAM FLOWS—RECENT ADVANCES AND THE ROAD AHEAD[1]

Brian Richter, Kathleen Williams, and Peter Aarrestad[2]

Richter, Brian, Kathleen Williams, and Peter Aarrestad, 2009. Introduction: Featured Collection on Instream Flows—Recent Advances and the Road Ahead. *Journal of the American Water Resources Association* (JAWRA) 45(5):1069-1070. DOI: 10.1111/j.1752-1688.2009.00359.x

Fish need water.

We hominids have understood this basic fact since our very first interactions with Pisces. After all, of what use are fins and gills without water?

Many of our fellow human beings find it incomprehensible that a river would be allowed to dry up from overuse or that a government would need to explicitly *allocate* water to a river. It is as though drying a river violates some universal law, or at least the laws of nature. How can a river be a river without water?

Perhaps, the fact that we have assumed the existence of some universal protection for rivers explains why it has taken so long for governments to provide legal requirements for water to be left in rivers. Or maybe we just could not imagine that we could use so much water that we could cause even once-great rivers like the Colorado, the Rio Grande, the Indus, or the Yellow to go dry.

Concerns for the health of rivers and fisheries in the United States (U.S.) date back to at least the 1600s, when hundreds of small mill dams were constructed in northeastern U.S. states, blocking the migrations of Atlantic salmon and other species. But concerns over the ecological impacts of water withdrawals did not begin to surface until the middle of the 20th Century, when the construction of large dams made it possible to divert large quantities of water or to rearrange natural patterns of river flow by storing and controlling water flows for hydropower generation and other purposes. In the 1950s, Donald Tennant, a fisheries biologist working for the U.S. Fish & Wildlife Service had grown concerned about what was happening to the rivers and streams he was studying. At the time, the U.S. was on a dam-building binge, constructing nearly 200 dams each year. Donald Tennant knew that these dams and the growing diversion of water from rivers and streams posed a grave threat to aquatic life. In the journal *Fisheries*, he wrote

> Philosophically, it is a crime against nature to rob a stream of that last portion of water so vital to the life forms of the aquatic environment that developed there over eons of time. (Tennant, 1976)

In river basins around the world, human demands for water continue to grow, and those demands are bumping up against the limits of supply. The U.S. General Accounting Office is projecting that as many as 36 states could face water shortages by the year 2013 (GAO, 2008). The International Panel on Climate Change, a United Nations network of scientists, estimates that by 2050 up to two billion people worldwide could be facing major water shortages (Bates *et al.*, 2008).

As the world's rivers have been increasingly tapped for water and harnessed for energy, we have come to realize that the ramifications of depleted rivers extend far beyond fish and other aquatic biota – there are

[1]Featured Collection Introduction. DOI: 10.1111/j.1752-1688.2009.00359.x.

[2]Respectively, Co-Director, Global Freshwater Program, The Nature Conservancy, 490 Westfield Road, Charlottesville, Virginia 22901; Executive Director, Instream Flow Council, P.O. Box 633, Bozeman, Montana 59771; and Supervising Fisheries Biologist, Connecticut Department of Environmental Protection, Inland Fisheries Division, Hartford, Connecticut 06106 (E-Mail/Richter: brichter@tnc.org).

serious consequences for our species as well. Just as species evolve in response to environmental conditions, human cultures have evolved and adapted to the availability of resources and services provided by healthy river ecosystems. The availability of fish and other sources of food, reeds, and timber for use as building materials, or the reliability of annual floods to supply moisture and nutrients that support floodplain agriculture or grazing have shaped and sustained human cultures around the world. People across the globe depend on fish as their primary source of protein. Rivers are prime attractants of tourism and recreation. Over many generations, the well-being, livelihoods, spiritual beliefs, and cultural practices of local communities have become intimately tied to river ecosystems.

Global concern over the fate of our rivers has given rise to a large and rapidly growing body of water professionals specializing in the issues of "instream flow" (also known as "environmental flow"). This term has been defined as "the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems" (Brisbane Declaration, 2007). During the past half-century, virtually every aspect of the science and practice of instream flow protection and management has advanced markedly through the efforts of experts from diverse disciplines – natural and physical scientists, engineers, lawyers, economists, social scientists, and other contributors – focusing intensely on the challenges associated with maintaining appropriate flows of water in rivers.

As part of its national conference, "*FLOW 2008: Interdisciplinary Solutions to Instream Flow Problems*," convened in San Antonio, Texas, in October 2008, the Instream Flow Council invited a panel of three experts to summarize the "state of the art" in the science, policy, and public dialog associated with instream flows. The Instream Flow Council (IFC) is a North American organization representing the interests of state and provincial fish and wildlife management agencies in the U.S. and Canada dedicated to improving the effectiveness of their instream flow programs. The expert panel's written contributions, included in this featured collection, were presented in both verbal and written form at the *FLOW 2008* conference. Based on input received from conference attendees, the three panelists revised their papers for this featured collection in the *Journal of the American Water Resources Association*.

In the first paper, Geoffrey Petts provides an overview of the scientific underpinnings of the methods and tools now being used to estimate the instream flow requirements of rivers, or types of rivers. Petts chronicles the evolution of scientific assessments from single-species approaches to recent attempts to address the water requirements of entire river ecosystems. Looking to the future, he highlights some of the looming challenges that must be better addressed by instream flow scientists: climate cycles, geomorphological cycles, biological dynamics, and the need for convergence among disciplines.

In the second paper, Larry MacDonnell reviews river and water policies in the U.S. and Canada as they relate to protection and improvement of flow conditions in rivers and water levels of lakes. MacDonnell provides a wealth of specific examples of state and provincial water law adaptations to the growing public interest in healthy rivers, including important policy connections between water quantity and quality, as well as surface and groundwater. He concludes with a discussion of policy elements that could prove especially conducive to future instream flow protection and restoration.

In the third paper, Mark P. Smith assesses the role of public dialog in instream flow decision-making. Smith offers a conceptual framework useful in assessing why some advocacy initiatives succeed while others fail. He draws from illustrative case studies and examines how advocacy coalitions are formed, the nature of policy-oriented learning that transpired, how policy proposals get onto the agendas of key policy makers, whether a "focusing" event helped to elevate attention to the issue, and the role of science in policy formulation.

These state-of-the-art summaries provide an excellent overview of both the progress that has been made by the instream flow community, while at the same time laying out a road map for the future. Additional *FLOW 2008* products are available at http://www.instreamflowcouncil.org. Given the strained condition of the planet's rivers, and the expectation of further increases in the human population and associated water demands, this featured collection of papers provides a bellwether of our future relationship with rivers.

LITERATURE CITED

Bates B.C., Z.W. Kundzewicz, S. Wu, and J.P. Palutikof (Editors), 2008. Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change. IPCC Secretariat, Geneva, 210 pp.

Brisbane Declaration, 2007. http://www.nature.org/initiatives/freshwater/files/brisbane_declaration_with_organizations_final.pdf, *accessed* September 19, 2008.

GAO (US General Accounting Office), 2008. Freshwater Supply: States' Views of How Federal Agencies Could Help Them Meet The Challenges of Expected Shortages. GAO-03-514. Washington, D.C.

Tennant, D.L., 1976. Instream Flow Regimens for Fish, Wildlife, Recreation and Related Environmental Resources. Fisheries 1:6-10.