

THE ENVIRONMENTAL HYDRAULICS TECHNICAL COMMITTEE WITHIN EWRI

Introduction

The general concern about the impact of humans on the environment and the search for more environmentally friendly engineering solutions has necessarily been reflected in civil engineering in general and hydraulic engineering in particular. What began as the ASCE Hydraulics Division now finds a home in the *Environmental and Water Resources Institute* (EWRI). The former Hydraulics Division convened a Research Advocacy Task Committee, which was entrusted with proposing a vision of hydraulic engineering for the next 20 years. The result was a paper, to be referred to below as EH, titled "Environmental Hydraulics: New Research Directions for the 21st Century" (ASCE Task Committee 1996).

A Technical Committee on Environmental Hydraulics has been reauthorized within the recently formed EWRI. This Forum Article is intended to introduce the committee to the hydraulic engineering community by means of a statement of the aims and scope of the Committee, to generate discussion on this subject, and to invite participation in its activities.

What Is Environmental Hydraulics?

As an essential preliminary, it is worthwhile to consider what is meant by the term "environmental hydraulics." A possible definition (also suggested in EH) of environmental hydraulics emphasizes the fluid mechanics of natural systems. This is also a subject area that is claimed by biologists, ecologists, geomorphologists, physical limnologists, and oceanographers. There may be significant overlap between topics studied by these workers and those of interest to hydraulic engineers, and EH has argued forcefully that hydraulic engineers need to engage in more dialog and closer collaboration with earth scientists.

Literally speaking, this is a composite term that describes the role of moving water in shaping and changing the environment, in terms of both its geomorphic and biotic aspects. These processes may be dictated by water alone, in which case water quantity and speed are important (e.g., floods); by pollutants transported by water, in which case water quality becomes important; or by both. More specifically, environmental hydraulics emphasizes the study of the linkages between the physical (hydrodynamic, sediment transport, and morphology), chemical (conservative and nonconservative mass transport, reaction kinetics, and water quality), and biotic (ecological) components of a system. The ultimate objective is to predict the response of the environment to a natural or human activity or to improve our ability to restore components of the environment. These linkages are illustrated in Fig. 1.

From this perspective, environmental hydraulics is both narrower and broader in scope than traditional hydraulics. It is narrower in that there are undoubtedly many hydraulics problems, such as scour around bridge piers, in which the environmental aspect is of minimal interest. At the same time it can be considered as broader in that it may venture beyond the bounds of hydraulics itself to include topics more traditionally dealt with by other disciplines, such as mass transfer, hydrodynamics-mediated reactions, and identifying stream-flow patterns that are of ecological significance.

The focus on natural systems has also resulted in a blind spot, which has obscured an entire topical area that could fit "naturally" within the scope of environmental hydraulics, namely, the fluid mechanics of water treatment processes. The

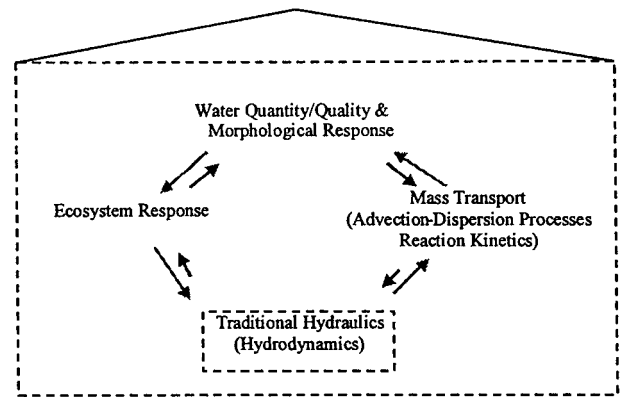


FIG. 1. Elements of Environmental Hydraulics

treatment plant is evidently a wholly artificial and "unnatural" system, yet its efficient operation may depend strongly on transport processes very familiar to hydraulic engineers and may have significant consequences for downstream water quality. One might also point out that historically, natural systems such as rivers, wetlands, and lakes, not to mention aquifers, played the role of treatment systems, and the treatment plants of today might therefore be seen as descendants evolved from natural systems. The hydrodynamics of water treatment processes, which has in the past been largely neglected by hydraulic researchers and left to environmental engineers, could potentially be a very fruitful field lying beyond the pale of traditional hydraulics.

The foregoing thoughts attempt to clarify the meaning and scope of the term environmental hydraulics, but it would be unwise to draw hard, impermeable boundaries around the term. Just as results in ecology and/or limnology may be found useful in engineering studies, fundamental research in traditional hydraulics, such as the turbulent flow over bedforms in alluvial channels, may have important implications for projects examining mass and heat transfer across the sediment-water interface.

Objectives

The objectives of the Environmental Hydraulics Committee in the Environmental and Water Resources Institute are threefold:

1. To promote the study of the fluid mechanics of natural and engineered systems, with the aim of improving our understanding of such systems and, hence, of our ability to predict reliably and ameliorate the impact of human intervention in the environment.
2. To encourage the transfer and application of understanding of fundamental transport processes and the consequent advancement of engineering practice and technology in the solution of problems with environmental consequences.
3. To enhance communication and collaboration between practitioners in relevant technical fields—notably, hydraulicians, geologists, environmental chemists and biologists, and the various professional societies, as well as the broader community, including regulators, and society at large. Collective technical know-how is needed to best manage wetlands and small streams, such as that illustrated in Fig. 2.



FIG. 2. The Study of Movement of Water, Sediment, and Pollutants through a Stream Surrounded by Wetlands (Reedy Creek, Caroline County, VA) Constitutes an Important Component of Environmental Hydraulics

Invitation

The Environmental Hydraulics Committee is off to a new beginning. It is evident that its objectives are broader and more interdisciplinary in nature than before. EWRI, which allows membership of nonengineers, provides an excellent environment for such a committee to grow and flourish. Therefore, the Committee extends an invitation to those of you who are

willing to contribute to this effort to contact one of us and express your interest in joining this committee. A balanced committee should consist of engineers and other professionals dealing with various aspects of the environment who are working for the private sector, for local, state, and federal agencies, and in academics. The Committee is looking for new ideas about potential task committees that would organize sessions in conferences, prepare monographs and state-of-the-art articles on topics of importance to our profession, establish collaborative ventures with other societies with similar interests, and carry out other activities. The Committee plans to meet during the Joint Water Resources Engineering and Planning & Management Conference, which will be held in Minneapolis, Minnesota, from July 30 to August 2, 2000.

Panos Diplas, Chairman
Virginia Polytechnic Inst. & State University
Blacksburg, VA
E-mail: pdiplas@vt.edu

Dennis Lyn, Vice-Chairman
Purdue University
West Lafayette, IN
E-mail: lyn@ecn.purdue.edu

Vince Neary, Secretary
Tennessee Technological University
Cookeville, TN
E-mail: vneary@tntech.edu