## RESTORING OUR NATURAL HABITAT

PROCEEDINGS OF THE 2007 WORLD ENVIRONMENTAL AND WATER RESOURCES CONGRESS

May 15–19, 2007 Tampa, Florida

SPONSORED BY
Environmental and Water Resources Institute (EWRI)
of the American Society of Civil Engineers

EDITED BY Karen C. Kabbes, P.E., D.WRE





## **Preface**

Restoring our natural habitat is a conference theme that sets a new direction for ASCE's EWRI. Instead of starting with the built environment, we approached this conference from the perspective of natural resources, examining our impact on our natural resources and how to mitigate those impacts as part of our work or as the focus of our work. International and national headlines continue to underscore that for society's long-term economic vitality and public safety, we need to understand our impact on natural resources and, if possible, restore those resources. These proceedings seek to further fulfill the vision of EWRI as being a place where engineers and other resource professionals interested in environmental and water resources issues can come together to address the state of our world in the future.

To put on a conference of this size and magnitude takes an incredible group effort. I would like to especially thank Paul Bizier, the Conference General Chair, who so ably steered me through what at times seemed a daunting task, Brian Parsons, EWRI Executive Director, and to the very capable staff of ASCE and EWRI including Donna Dickert, Sheana Singletary, Adele Dicken and the unnamed others who made it all come together. The true success of these proceedings, however, falls on the many EWRI leaders, all nationally recognized professionals, who stepped forward as technical track chairs and co-chairs to review abstracts and papers, organize sessions and worked to attract the quality authors and papers that make these proceedings so valuable. Those co-editors include:

Marge Bedessem Balu Bhayani Kathlie Bulloch Ximing Cai Hal Cardwell Don Carpenter Sheila Carpenter-van Dijk Amy Chan-Hilton Serban Constantinescu Victor Cook Jeff Cunningham Matthew Davis **Robert Evans** Shou-Shan Fan Tim Feathers Richard Field

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Mark Ross
Arthur Schmidt
Sandeep Sethi
Jery Stedinger
Jennifer Strassfeld
Scott Struck
Marty Teal
Jim Uber
William R. Wise
Daniel Yeh

## **Committee Members:**

Paul Bizier, P.E., F.ASCE, General Chair Sheila Carpenter-van Dijk, E.I., M.ASCE, Local Arrangements Chair Brian Parsons Greg Chomic Victor Cook Blake Guillory Karen Karvazy Noreen Poor Daniel Yeh

Karen C. Kabbes, P.E., D.WRE

Technical Program Chair

## **Photo Contest**

The photograph on the cover of these proceedings is the winner of the seventeenth annual water resources photography contest, sponsored by the Environmental and Water Resources Institute (EWRI) of the American Society of Civil Engineers (ASCE), Wright Water Engineers, Inc., and WEST Consultants, Inc. Members of all ASCE and EWRI student chapters and clubs and ASCE Younger Members were invited to submit original photographs consistent with the theme of the conference. Photographs were evaluated by the EWRI Student Activities and New Professionals Council and by EWRI/ASCE Headquarters staff.

The winning photographer is C. Shawn Klingener, a Younger Member from Haverhill, Mass. As the contest winner, Mr. Klingener will receive a complimentary registration and travel expenses to the EWRI World Environmental and Water Resources Congress in Tampa, Fla., May 15–19, 2007, where he will be formally recognized. The photograph is of the Rogue River in southwestern Oregon, one of the original eight rivers included in the Wild and Scenic Rivers Act of 1968 to "be preserved in free-flowing condition" in recognition of their "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values."