



ENGINEERING APPROACHES TO ECOSYSTEM RESTORATION

CONFERENCE PROCEEDINGS

1998 Wetlands Engineering & River Restoration Conference

March 22–27, 1998

Adams Mark

Denver, Colorado

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Abstract

Restoring or establishing complex ecosystems such as wetlands, riparian zones, and streams requires interdisciplinary cooperation. Engineers have long been part of these interdisciplinary teams, but little information has been available to assist in developing or evaluating engineering approaches to restoration. This proceedings, *Engineering Approaches to Ecosystem Restoration*, contains papers presented at the 1998 ASCE Wetlands Engineering and River Restoration Conference held in Denver, Colorado, March 22-27, 1998. These papers provide valuable insights to successful approaches for river restoration, wetland restoration, watershed management, and the use of constructed wetlands for water and wastewater treatment. Successful and unsuccessful case studies from Florida to Alaska and all places between are described. Potential solutions to a wide variety of ecosystem concerns in urban, suburban, and coastal environments are presented. The proceedings also contains summaries of discussion sessions on hot-button topics related to restoration such as "Is true watershed management achievable?", "Buzzwords", "Do ecologists and engineers have differing views of restoration?", and many others.



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J. Craig Fischenich, General Conference Chair
Donald F. Hayes, Technical Program Chair
Maurice Albertson, Wetlands Technical Track
Marla Berman, Student Members
Meg Burns, Continuing Education
Jack Davis, Exhibits
Marshall Flug, Rivers Technical Track
Peter Goodwin, Watershed Technical Track
Neil S. Grigg, Local Arrangements
Albert Yeung, Sponsors

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Donald F. Hayes, University of Utah, Salt Lake City, UT
J. Craig Fischenich, Waterways Experiment Station, Vicksburg, MS



Foreword

Civil engineers have been involved with restoration activities for many years. Yet, the 1998 ASCE Wetlands Engineering & River Restoration Conference was the first concerted effort to provide professional development and technical information exchange in this emerging engineering field. The conference brought together engineers and scientists involved in watershed and ecosystem restoration to share ideas, knowledge, and successful designs. The registered attendance of 1003 reflects the interest in these topics and the need for similar opportunities in the future.

Five ASCE technical divisions—Environmental Engineering, Geotechnical Engineering, Waterway, Port, Coastal, and Ocean Engineering, Water Resources Engineering, and Water Resources Planning and Management—cooperated to develop a conference with balanced participation among the divisions. The conference committee also sought strong representation from scientists involved in restoration projects. About 50% of conference attendees were ecologists, biologists, hydrologists, geologists, landscape architects, chemists, or associated with other science disciplines. Discussion sessions on selected topics helped convert conference attendees into conference participants. These sessions, combined with the integration of disciplines, resulted in a unique opportunity for exchanging ideas and establishing relationships with other professionals working on restoration projects. Many conference attendees commented on beneficial interactions during the conference.

These proceedings contain most of the more than 220 technical papers presented during 60 technical sessions at the 1998 Wetlands Engineering and River Restoration conference. The papers focus on four topical areas: a) watershed management, b) river restoration, c) wetland restoration, and d) constructed wetlands for stormwater and wastewater treatment. The papers in these proceedings illustrate the similarity between these topics. The result is a valuable source of information for anyone involved with wetland restoration, river restoration, watershed management, or treatment wetlands. Integrating science and engineering viewpoints within a single volume makes these proceedings particularly useful for the practitioner.

Each paper included in these proceedings has been accepted for publication by the Editor. All papers are eligible for discussion in the appropriate ASCE journal - *Journal of Waterway, Port, Coastal, and Ocean Engineering*, *Journal of Environmental Engineering*, *Journal of Water Resources Engineering*, or *Journal of Water Resources Planning and Management*. All papers are eligible for ASCE awards.



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Moderator: Marshall Flug

Design of a Constructed Treatment Wetland for Restoring an Estuary Lagoon

C. Charles Tai, Marc Adkins, and Donthamsetti V. Rao

Water Quality of the Clearwater River: Effect of Nonpoint Sources and a Strategy for Improvement

Mark R. Deutschman and Maggie Leach

Creating an Oxbow in a Channelized Creek To Improve Water Quality and Wildlife Habitat

Walid M. Hatoum

Wetland Creation with Focus on Water Quality Improvement: A Case Study from Delaware*

Ken Dunne, Mahendra Rodrigo, Chandi Rodrigo, and Skyler Mills

SESSION J-5
Natural Processes in Riparian Wetlands
Moderator: Panayiotis Diplas

Turbulence Characteristics of Flows through Partially and Fully Submerged Vegetation

Jonathan D. Fairbanks and Panayiotis Diplas

Velocity Profiles in Riparian Wetlands

Clayton C. Hodges and Panayiotis Diplas

Limiting Riparian Hardwood Encroachment along the Trinity River, California

John H. Bair

Evaluation of River Management Impacts on Riparian Wetland Functions Using the Wetland Hydrologic Index

Mary M. Davis and Jerry Ziewitz



SESSION J-6

Sustainable Water Resource Development in Latin American Countries: I

Moderator: Phil Combs

Restoration of the Everglades*

Rock Salt

The Hidrovia Project*

Dean Thompson

EDF Perspective on Water Resource Development in Latin America*

Deborah Moore

IRN's Perspective on Sustainable Development*

Glenn Switkes

SESSION K-1

Large River Restoration: Main Channel Techniques

Moderator: Terence M. Browne

Hydroacoustic Study of Fishes in Bendway Weir Fields of the Middle Mississippi River

Robert D. Davinroy, Robert J. Rapp, and Roger E. Myhre

Rehabilitation of the Chicago River

Terence M. Browne

Vegetative-Based Solution to Controlling Overbank Scour in the Mississippi River Floodplain, Mississippi County, Southeast Missouri

Robert J. Rapp, Lester Goodin, and Robert Davinroy

Current Research Topics in the UK: Use of Woody Vegetation for River Bank Stabilization with Special Reference to Willows

N. Christine Perala-Gardiner

SESSION K-2

Managing Water Resource Systems for Channel Restoration

Moderator: Robert T. Milhous

Objective Condition Assessment for Inland Navigation Structures

David T. McKay

Altered Green River Flows Impact Rare Fish Habitat

Edmund J. Wick and Brian L. Cluer

Restoring River Substrate Using Instream Flows: The Gunnison and Trinity Rivers

Robert T. Milhous

Fabric and Vegetation Facilitate Deposition Within Riverine Revetment*

Jeffrey A. Hart and Tyson Holmes



SESSION K-3

Water Quality Changes in Stream and Wetland Environments

Moderator: John J. Warwick

Initial Analysis of Water Quality Changes on Muddy Creek

R.J. Wittler, Sean D. Keeney, and A.W. Rollo

Sedimentation in Vegetated Rivers

Marcelo H. García and Fabián López

Sediment-Based Intrinsic Bioremediation of a Contaminated Wetland Environment

Sheau-Yun Chiang, Jennifer C. Wynn, F. Michael Saunders, and Xiaolan Wang

Performance Data from Model Constructed Wetlands for Wastewater Treatment

Otto Stein, J.A. Beiderman, P.B. Hook, and W.C. Allen

SESSION K-4

Successful Approaches to Watershed Planning

Moderator: John L.P. Gardiner

An Environmental History of the Tillamook Bay Estuary and Watershed

Kevin G. Coulton, Philip B. Williams, and Patricia A. Benner

Winning Back Our Wetlands: Getting to the Root of the Issue

John L.P. Gardiner

Development of Proposed Regulations for Protection of Delaware River Basin Waterway Corridors

Paul J. Webber

A Belated Attempt at Sediment Control and Watershed Planning in the Mill Creek Watershed

Scott C. Martin, Michael G. Crowe, and William J. Schollaert

SESSION K-5

Geomorphic Approaches to Restoration Design

Moderator: Peter Goodwin

Frequency and Duration of Bankfull Flow and Application for Natural Channel Design

Richard D. Hey

A Geomorphic Channel Design for Napa River

Vincent S. Neary, Philip Williams, and Peter Goodwin

Application of Hydrogeomorphic Concepts To Assess Riparian–Wetland Functions Affected by Road Construction in Southwestern Montana

Dennis C. Wenger

The Reference Reach: A Blueprint for Natural Channel Design

Dave Rosgen



SESSION K-6

Unique Functional Considerations for Wetland Restoration

Moderator: Dexter Meadows

Functional Considerations For Restoration: A User's Guide for Streambank Stabilization

Dexter Meadows

Channel Degradation Due to Gravel Mining: Application of Geomorphic Analysis and Sediment Transport Modeling Approaches

Jennifer Wulforst and George Annandale

Hydric Soils: A Summary of the State-of-Practice*

Steve Sprecher

Urban Channel Restoration: Design and Monitoring

Wendi Goldsmith, Kirk R. Barrett, Marit Larson, and William Lattrell

SESSION M-1

Backwater and Side Channel Restoration along Large Rivers

Moderator: Vincent Neary

River Restoration Measures in Four Secondary Channels of the Mississippi River: An Interagency Success Story

Robert D. Davinroy, David C. Gordon, Robert D. Hetrick,
Steven L. Redington, and Claude N. Strauser

Missouri River Fish and Wildlife Mitigation: Benedictine Bottoms Mitigation Site .. 1038

Robert G. Dimmitt, W. Glenn Covington, Ronald G. Jansen, Mary P. Perlea,
and Richard F. Geekie

Restoration of Side Channels and Backwaters on the Channelized Missouri River*

Steve Rothe

Deep-Planting Willow Cuttings Via Water Jetting

Lon Drake and Rick Langel

SESSION M-2

Earthen Urban Channels and Bioengineering: Will They Work?

Moderator: Scott Gillian

Restoring Naturalized Stream Bed in an Urban River Channel

David C. Nyman

Considerations in Stream Restoration

Peggy M. Bailey and Michael J. Erion

Stream Restoration and Streambank Protection Using Soil Bioengineering Measures in Massachusetts

Dennis A. Verdi

Stream Restoration with Soil Bioengineering: Making Believers

Alan D. Wood



SESSION M-3

Channel Design for Bankfull Flow

Moderator: David J. Griffin

Dominant Discharge as a Design Criteria in River Restoration

Peter Goodwin, Charles W. Slaughter, and Rick Marbury

Field Verification of Bankfull Discharge: Lessons Learned at White Marsh Run

Darcy K.L. Austin, James W. Gracie, and Alex Soutar

A Study of Recurrence Intervals, Sediment Transport Effectiveness, and Influence of Watershed Imperviousness of Field Identified Bankfull Conditions in Piedmont Streams of Maryland*

David J. Griffin

Channel Restoration Using Indicators of Bankfull

David J. Griffin

SESSION M-4

Large Scale Floodplains and Riparian Restoration

Moderator: Kevin G. Coulton

The Pacific Northwest Floods of 1996: Lessons Learned?

Kevin G. Coulton

Protocols for Site Assessment and Monitoring in (Soil) Bioengineering Stream Bank and Floodplain Revegetation*

Christine Perala-Gardiner

Riparian Habitat Replacement Within Active Floodplains

Bruce M. Phillips

Environmental Interpretation and Its Role in the Kissimmee River and Lake Okeechobee Restoration Programs

Margaret A. Barletto and Carlos L. de la Rosa

SESSION M-5

Hydrogeomorphic Approaches for Wetland Restoration

Moderator: Mary Davis

HGM Reference Standards and Wetland Restoration

D. Eric Somerville and Wade L. Nutter

Use of Riparian–Geomorphic Relationships To Evaluate Flows Necessary for Riparian Restoration: A Case Study of the Diamond Fork River, Utah

Leslie Gecy and Robert Gecy

Applications of the Hydrogeomorphic (HGM) Approach for Functional Wetland Assessment*

Mary Davis



SESSION M-6

Sustainable Water Resource Development in Latin American Countries: II

Moderators: Phil Combs and Julio Luna

The HIDROVIA Project: Should We Be Concerned for Fish Resources?

Claudio Baigún and Norberto Oldani

Fishway Performances in South American Regulated Rivers

Norberto Oldani, Claudio Baigún, and Ricardo Delfino

The Bank's View of Water Resource Development*

Peter Smith

Commercial Navigation Issues on the Parana River*

Allen Mott

POSTER SESSION

Willamette River Valley Floodplain Restoration

Kevin G. Coulton, Peter Goodwin, and Christine Perala-Gardiner

Wetlands Hydraulic Investigation Project*

Jay Polinkas

Targeting Wetland Restoration Using GIS

Dale M. Haupt, Christopher J. Bruce, and Brian P. Bledsoe

Measurement of Denitrification Rates in a Constructed Wetland Receiving Municipal Solid Waste Landfill Leachate

Darlene D. Kozub and Sarah K. Liehr

Delaware Department of Transportation: State Route 1 Wetland Mitigation Program*

Joe Wutka, Theresa Fulmer, Ken Dunne, and Mahendra Rodrigo

Contaminant Exchange Mechanisms at the Sediment–Stream Interface*

John A. McEnery

The Importance and Methodology of Tidal Reckoning for Marsh Restoration*

Roger J. Leventhal and K. Lenington Collins

Coir Products and Their Role in Wetland Engineering*

Lanka Santha and Calista R. Santha

Wetland Ecological Integrity: An Assessment Approach*

Bruce K. Carlisle, Jan P. Smith, and Anna L. Hicks

Restoration of the Ecological Capacity of Large Rivers and Their Floodplains Illustrated at Two Areas on the Lower Rhine River, Germany*

Heike Rösger

DISCUSSION SESSION B

Do Ecologists and Engineers Have Differing Views of Stream Restoration?

Jon Fripp, Jean O'Neil, and Wendi Goldsmith

Sustainable Development; Ecosystem Management

Charles W. Slaughter, N.C. Perala-Gardiner, and John Gardiner



Long-Term Effects of Suspended Solids Loads on Constructed Wetland Performance

Panayiotis Diplas

What Level of Engineering is Needed for Restoration Projects?

Michael T. Schwar and Jerry Bernard

DISCUSSION SESSION F

Native vs. Exotic; Natural Colonization vs. Planting

Wendi Goldsmith and Robbin B. Sotir

What Medium is Best for Subsurface Flow Constructed Wetlands?*

Maurice Albertson

Working with Communities and Incorporating Public Comment: Survival Tips?*

Ann Riley

Can It Be Ecologically Beneficial To Engineer Existing Wetlands for Stormwater Management and Should It Be Permitted?*

Kirk R. Barrett

DISCUSSION SESSION L

Stream Classification Systems: Useful Tools for Restoration?*

Dave Rosgen and Bob MacArthur

Habitat Development and Wastewater Treatment Wetlands: Natural Combination or Recipe for Failure?

Margaret McBrien and Donald Hayes

Is True Watershed Management Achievable?

Dexter Meadows and Roy Mink

How Do We Educate Our Future Restoration Specialists?

Pierre Y. Julien

***Paper not available at time of publication.**