



## Editorial

## Ecological engineering of sustainable landscapes



## ARTICLE INFO

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## ABSTRACT

This editorial describes a 25-paper special issue that began with a symposium at EcoSummit 2016 in Montpellier France in August/September 2016 with a focus on ecological engineering principles applied to the development of large-scale sustainable landscapes and catchments. The papers are divided into the following categories: watershed management (3 papers); wetland creation and restoration (5 papers); monitoring wetlands (3 papers); lake management (2 papers); restoration of wetland and terrestrial landscapes (6 papers); public health (2 papers); and ecotechnological solutions (4 papers). Some of these case studies are purposeful application of ecological engineering principles; others happened or are happening naturally through self-design. Several of the presentations focus on ecological engineering that involves scales of thousands of hectares or even larger catchments to solve ecological and environmental problems. Case studies are presented by scientists and engineering from North America, Europe, and South America.

## 1. Introduction

Ecological engineering has been defined as the design of sustainable ecosystems that integrate human society with its natural environment for the benefit of both (Mitsch, 1993, 2012; Mitsch and Jørgensen, 2003, 2004). While most examples of ecological engineering include relatively small-scale ecosystems such as treatment wetlands, restored river courses and floodplains, and stabilization of hilly terrain, there are some cases where ecological engineering principles have been applied to large-scale landscapes and catchments. Some of these were purposeful application of ecological principles; others happened or are happening naturally through self-design. The papers in this special issue focus on ecological engineering that involves large catchment scales of thousands of hectares or even more to solve ecological and environmental problems and are presented by scientists and engineers from North America and Europe, many of whom participated in a special session by the same title as this editorial at EcoSummit 2016 in Montpellier France.

## 2. EcoSummit 2016

Several of the papers in this special issue are the result of presentations at a special session (symposium) held at the 5th International EcoSummit held in Montpellier, France on August 29–September 1, 2016. EcoSummit 2016 provided a forum for more than 1300 delegates from 75 countries to focus on finding solutions for today's massive environmental and ecological problems. Sessions were held on ecological engineering, ecological restoration, green infrastructure, adaptation to climate change, earth stewardship, ecohydrology, eco-informatics, ecological modeling, sustainable agriculture, protection of biodiversity, carbon sequestration, human ecology and enhancement of ecosystem services.

EcoSummit 2016 hosted 11 plenary presentations by some of the world's premier ecologists and environmental scientists including Giovanni Bidoglio, *Italy*; Sandra Díaz, *Argentina*; John Philip Grime, *UK*; Connie Hedegaard, *Denmark*; Stephen P. Hubbell, *USA*; Blanca E. Jiménez Cisneros, *France*; Sandra Lavorel, *France*; Bai-Lian (Larry) Li, *USA*; William J. Mitsch, *USA*; Mihir Shah, *India*; and Peter Vitousek, *USA*. Over 750 presentations were given in 93 scientific sessions. There were also 15 side events in the form of workshops, round tables and world cafés. More than 600 posters were also displayed during EcoSummit 2016.

EcoSummit was founded in the mid-1990s as a forum to meet the demands of scientists working in several new ecological disciplines, and who required a better understanding of the concepts and methods for a holistic use of ecology in environmental management. EcoSummit 2016 is the fifth EcoSummit held around the world since the first one was held twenty years ago in 1996 in Copenhagen, Denmark. Other EcoSummits were then held in Halifax Nova Scotia, Canada (EcoSummit 2000), Beijing, China (EcoSummit 2007), and Columbus, Ohio, USA (EcoSummit 2012; see <http://ecosummit2016.org/ecosummit-2012.asp> for a listing of journal special issues from that conference). See the history of previous ecosummits at <http://ecosummit2016.org/ecosummit-history.asp>

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**Table 1**

Presentations at EcoSummit 2016 in Special Session 49 “Ecological Engineering of Sustainable Landscapes” in Montpellier, France, August 31, 2016. Speaker is indicated by \* for multiple-author presentations.

Title of Presentation	Oral presentation or poster	Presenter
Hydrology controls nitrate and pesticide removal efficiency in constructed wetlands and buffer zones intercepting agricultural drainage runoff	oral	J. Tournebize, IRSTEA, France and Ulo Mander*, University of Tartu, Estonia
Response of vegetation to hydrologic degradation and recovery in isolated cypress domes of west-central Florida, USA	oral	Chris Anderson* and M.K. Bartholomew, Auburn University, Auburn, Alabama, USA
Restoring the Greater Florida Everglades once and for all	oral	William J. Mitsch, Florida Gulf Coast University, Naples, Florida, USA
Can floodplain restoration achieved with the two-stage ditch alter nutrient export from agricultural watersheds?	oral	Jennifer Tank*, S.F. Christopher, and U.H. Mahl, University of Notre Dame, Notre Dame, Indiana, USA
Potential public health benefits associated with large-scale restoration of wetlands	oral	Jason Marion, Eastern Kentucky University, Richmond, Kentucky, USA
Toward sustainable protection of public health: The role of wetlands as a frontline safeguard of pathogen and antibiotic resistance spread	oral	Jiyoung Lee*, T.D. Hsu, D. Mollekopf, and T. Wittum, The Ohio State University, Columbus, Ohio, USA
Phosphorus dynamics in the sediment-water interface of agricultural reservoirs: Implications for lake restoration strategies	oral	Keunyea Song* and A. Burgin, University of Kansas, Lawrence, Kansas, USA
Wetland landscape management using microbial indicators	oral	Toshi Urakawa, Florida Gulf Coast University, Ft. Myers, Florida, USA
Assessment of large-scale wetland restoration in Kentucky (USA) watersheds	oral	Brian Reeder, Morehead State University, Morehead, Kentucky, USA
Greenhouse gas emissions in treatment wetlands with ornamental plants under tropical conditions	oral	Elizabeth Hernandez, INECOL, Xalapa, Veracruz, Mexico
Phragmites australis, a natural ecosystem engineer, alters wetland biogeochemistry to survive under global change scenarios	oral	Blanca Bernal*, J.P. Magonigal, and T.J. Mozdzer, Smithsonian Environmental Research Center, Edgewater, Maryland, USA
A mangrove creek restoration plan utilizing hydraulic modeling	oral	Darryl Marois and William J. Mitsch*, USEPA, Newport, Oregon, USA and Florida Gulf Coast University, Naples, Florida, USA
Designing ecosystem biogeochemical processes to improve water quality in drastically disturbed watersheds	oral	Robert Nairn, Oklahoma University, Norman, Oklahoma, USA
Recovering from mining: what we've learned from restoring our reclaimed landscapes	oral	Rebecca Swab* and R. Glover, The Wilds, Cumberland, Ohio, USA
Implementing real-time long-term weather/climate/hydrology/water quality field stations in brackish and freshwater wetlands in the Southwest Florida, USA	oral	Li Zhang*, W.J. Mitsch, and S. Thomas, Florida Gulf Coast University, Naples, Florida, USA
Landscape and remediation: Grass strips, hedges and constructed wetlands	oral	Sylvie Dousset, University of Lorraine, France
Integrated approaches for improving the landscape connectivity	oral	Alexandre Marco da Silva, UNESP, Brazil
Solar powered electrocoagulation system with granular sand filtration for phosphorus removal from surface water	poster	Jabari Lee*, D. Franco, J-Y. Kim, Florida Gulf Coast University, Ft. Myers, Florida, USA
Rhizosphere microbiomes of floating treatment wetland revealed the importance of complex biogeochemical processes	poster	Toshi Urakawa*, D.L. Dettmar, S. Thomas, Florida Gulf Coast University, Ft. Myers, Florida, USA
Towards sustainable management of mobile rivers: example of an engineering approach for assessing and preventing the risk of sediment trapping related to the capture of former gravel pits, Allier river, France	poster	D. Goutaland, D. Bachelierie, J. Lecomte, Catherine Neel*, CEREMA Centre-Est, CEREMA Nord-Picardie, France

2.1. EcoSummit 2016 Special Session on Ecological Engineering of Sustainable Landscapes

The papers in this special issue are partially based on 17 oral presentations in a special session at EcoSummit 2016 entitled “Ecological Engineering of Sustainable Landscapes” held on August 31, 2017 (Table 1). Extra invited papers not presented in that session or presented as posters were also included in this special issue. A photo of the speakers and participants in that special session is shown in Fig. 1.



Fig. 1. Presenters and Participants in Session 49 Ecological Engineering of Sustainable Landscapes at EcoSummit 2016, Montpellier France, August 31, 2016.

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