International Journal of
ECOHYDROLOGY & HYDROBIOLOGY
Vol 8, No 2-4, Year 2008

Proceedings of the International Conference
Ecohydrological Processes and Sustainable Floodplain Management
Opportunities and Concepts for Water Hazard Mitigation and
Ecological and Socioeconomic Sustainability in the Face of Global Changes
19-23 May 2008, Łódź, Poland

klick on title to read the abstract

.....klick on page range for the full text

Contents

Ecohydrol. Hydrobiol. 8 (2-4), 105-106, 2008
DOI: 10.2478/v10104-009-0034-8

Declaration on Sustainable Floodplain Management – change of perspective

Based on the presentations and discussions at the International Conference on Ecohydrological Processes and Sustainable Floodplain Management: Opportunities and Concepts for Water Hazard Mitigation, and Ecological and Socioeconomic Sustainability in the Face of Global Changes

(multiple authors)

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 107-113, 2008
DOI: 10.2478/v10104-009-0008-x

Rationale for the "Floodplain Declaration" from environmental conservation toward sustainability science.

Maciej Zalewski

International Institute Polish Academy of Sciences, European Regional Centre for Ecohydrology under the auspices of UNESCO, 3 Tylna Str., 90-364 Łódź, Poland,
and
University of Łódź, Department of Applied Ecology, 12/16 Banacha Str., 90-237 Łódź, Poland.
e-mail: mzal@biol.uni.lodz.pl

Abstract

In the Anthropocene era 73% of the Earth's surface has been changed by Man into various forms of "novel ecosystems" such as agrocenosis, urbanized centers and transport pathways. These are characterized by degradation of the hydrological cycle, emission of nutrients and pollutants, which result in a drastic reduction of biodiversity and ecosystem services for societies. Due to seasonal changes of the hydrological cycle, river floodplains are the most dynamic, resilient and diversified ecosystems. Their role in providing food has been known from the beginning of human civilization. The importance of reducing extreme event impacts, such as floods and droughts, to river purification is well recognized. However, there is still a further need for insights of these and other processes under changing climatic conditions. Therefore, "engineering harmony" between river valley ecosystems and societies (UN MDGs) requires solutions from integrative, transdisciplinary science such as ecohydrology, a sub-discipline of sustainability science focused on ecological aspects of the hydrological cycle, based on:

- integration of specific knowledge of various disciplines with special consideration of the economic aspects,
- understanding of the past (e.g., cultural heritage, paleohydrology, ecological succession patterns)
- considering society's priorities vs. ecosystem carrying capacity, and
- identification of future scenarios applying systemic-approach and "foresight" methodology.

The reversal of world wide degradation of floodplains should become an encouraging case for development of sustainability science, fundamental for mutual co-evolution of the ecosphere and anthroposphere.

Key words: Ecohydrology, ecological engineering, engineering harmony, integrative sciences, cultural heritage.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 115-138, 2008
DOI: 10.2478/v10104-009-0009-9

Towards a sustainable management concept for ecosystem services of the Pantanal wetland

Karl M. Wantzen[1,2*], Cátia Nunes da Cunha[2], Wolfgang J. Junk[2,3], Pierre Girard[2,4], Onélia Carmen Rossetto[5], Jerry M. Penha[2,4], Eduardo G. Couto[2,6], Michael Becker[7], Gabriela Priante[8], Walfrido M. Tomas[29], Sandra A. Santos[9], José Marta[10], Ivens Domingos[7], Fatima Sonoda[8], Marise Curvo[8], Claudia Callil[2]

[1]ATIG - Aquatic-Terrestrial Interaction Group, Faculty of Biology, Postfach M659, University of Konstanz, D-78457 Konstanz
*e-mail: matthias.wantzen@uni-konstanz.de
[2]Nucleo de Pesquisas Ecologicas do Pantanal (NEPA), Institute of Biosciences, Federal University of Mato Grosso, Av. Fernando C. da Costa s/n, 78060-900 Cuiabá-MT, Brazil
[3]Max-Planck Institute of Evolutionary Biology, Postfach 165, 24302 Plön, Germany
[4]Centro de Pesquisas do Pantanal (CPP), Federal University of Mato Grosso, Av. Fernando C. da Costa, s/n, 78060-900 Cuiabá-MT, Brazil
[5]Faculty of Geosciences Federal University of Mato Grosso, Av. Fernando C. da Costa s/n, 78060-900 Cuiabá-MT, Brazil
[6]FAMEV, Federal University of Mato Grosso, Av. Fernando C. da Costa s/n, 78060-900 Cuiabá-MT, Brazil
[7]WWF-Brasil, Pantanal Forever Programme, SHIS EQ QL 6/8\nConjunto E 2° andar s\n, Brasília, DF , 71620-430, Brazil
[8]Secretary for the Environment, Mato Grosso State (SEMA/MT) CPA, 78050-970 - Cuiabá-MT, Brazil
[9]Centro de Pesquisas Agropecuária do Pantanal EMBRAPA Pantanal, Rua 21 de Setembro, 1880 - Caixa Postal 109 - 79320-900 Corumbá, MS- Brazil
[10]Faculty of Economy, Federal University of Mato Grosso, Av. Fernando C. da Costa s/n, 78060-900 Cuiabá-MT, Brazil

Abstract
Among globally important wetlands, the Pantanal stands out because of its a history of harmonious coexistence of man and biodiversity. In the recent years, however, severe human impacts have emerged, which are capable of disintegrating Pantanal's natural characteristics. This paper contributes to the development of a sustainable management concept considering ecological and socioeconomical demands. Use of natural resources in the highly productive catchment of the tributaries have direct effects on the floodplains of the Pantanal. A careful planning of hydropower plants is needed to maintain (a) some of the tributaries remaining open for fish spawning migration, and (b) the natural flood pulse as the overriding ecological factor. The traditional human population of the Pantanal is threatened the developments of global change. Their knowledge to use floodplain-specific species is very important for developing sustainable use strategies. Several positive initiatives are highlighted, including the development of a green seal for Pantanal beef and the re-establishment of gallery forests along tributaries. The sustainable use of the fish ressources requires a precise analyis of the stock dynamics. For the further development of the sustainable use, a classification system is needed, which specifies the use potential and conservation demands of the individual habitats.
Key words: Pantanal, floodpulse advantage, traditional knowledge, biodiversity, adaptive management, Brazil, South America

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 139-147, 2008
DOI: 10.2478/v10104-009-0010-3

Ecological engineering of floodplains

William J. Mitsch, Li Zhang, Daniel F. Fink, Maria E. Hernandez[1], Anne E. Altor[2], Cassandra L. Tuttle[3], Amanda M. Nahlik

Wilma H. Schiermeier Olentangy River Wetland Research Park, The Ohio State University, 352 W. Dodridge Street, Columbus, OH 43202 USA
e-mail: mitsch.1@osu.edu

[1] current address: Environmental Biotechnology Unit, Institute of Ecology, Congregación el Haya, AP 63, Xalapa 91070, Veracruz, Mexico

[2] current address: Williams Creek Consulting, 919 North East Street, Indianapolis, IN 46202 USA

[3] current address: ARCADIS, 8 South River Road, Cranbury, NJ 08512 USA

Abstract

We have proposed restoring and creating over 2 million hectares of wetlands in the 3 million km^2 Mississippi-Ohio-Missouri River Basin in the USA to serve as sinks for farmland nutrients that are otherwise causing a 15 000 – 20 000 km^2 hypoxic (extremely low oxygen) condition in the downstream Gulf of Mexico. We have conducted two main multi-year experiments on full-scale wetlands at the Olentangy River Wetland Research Park in Ohio, USA, to investigate proper ecological design for these wetlands. One of those experiments - a river pulsing study - is presented here. Three wetlands were subjected to flood pulses from the adjacent river compared to one year when there was only steady-flow of river water into the wetlands. Generally river pulsing appears to have increased macrophyte productivity and diversity and avian fauna abundance and diversity, while retaining similar or even more nutrients than steady-flow conditions. Pulsing conditions also decreased aquatic productivity, organic sedimentation, methane and nitrous oxide emissions (both greenhouse gases) and increased denitrification, one of the most important processes in wetlands for retaining nitrogen from agricultural fields. Eight conclusions on river pulsing and floodplain engineering are presented.

Key words: Olentangy River Wetland Research Park, created wetlands, river diversion, pulsing hydrology, nitrogen pollution, greenhouse gases, denitrification

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 149-157, 2008
DOI: 10.2478/v10104-009-0011-2

Aquatic macrophytes and hydro-electric power station reservoirs in regulated rivers: man-made ecological compensation structures and the "ecological potential"

Georg Albert Janauer[1], Eva Lanz[1], Udo Schmidt-Mumm[1], Brigitte Schmidt[1], Herwig Waidbacher[2]

[1]University of Vienna, Department of Limnology and Hydrobotany, Althanstrasse 14, 1090 Vienna, Austria,
e-mail: georg.janauer@univie.ac.at
[2]University for Natural Resources and Applied Life Sciences, Institute of Hydrobiology and Aquatic Ecosystem Management, Max-Emanuel Str.17, 1180 Vienna.

Abstract
Ecological compensation structures in the reservoir of the Freudenau hydro-electric power plant (River Danube, Vienna, Austria) developed into habitats dominated by aquatic macrophytes. Ecological functioning of the macrophytes is documented by their attractiveness to several fish guilds, including the rheophilic group and by their ability to restrict phytoplankton growth. However, in comparison with different types of natural floodplain water bodies in the Danube River corridor, with other power plant reservoirs and with the free flowing reach of the Austrian Danube between Vienna and Bratislava the composition of the indicator species among the aquatic plants was significantly different, as proven by statistical analysis. This puts the compensation structures at an intermediate position between the macrophyte vegetation of power plant reservoirs without such constructions and certain floodplain water ensembles as well as the free flowing reach. Some similarities exist especially with respect to the distribution of growth forms of the aquatic plants. Based on these results it can be concluded that with regard to the Water Framework Directive such compensation structures may serve as a means to provide conditions to meet the "good ecological potential".
Key words: Danube, Water Framework Directive, ecosystem services, ecohydrology

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 159-167, 2008
DOI: 10.2478/v10104-009-0012-1

Influence of restricted access to floodplains on life-history patterns in fish: implications for conservation

John E.Thorpe

Faculty of Biomedical & Life Sciences, University of Glasgow, Glasgow G12 8QQ. Scotland. UK.
e-mail: johnethorpe@btinternet.com

Abstract
Natural selection has tailored the developmental characteristics of animals to the natural ranges of variation of their environments, so that human restriction of those environments tends to restrict the range of variety within species dependent on them. Understanding how restricting access to the floodplain through river engineering for flood management may affect fish species requires understanding their life history strategies, which in turn requires understanding their reproductive processes, and specifically understanding the maturation process itself. Maturation is treated here as a problem of allocation of surplus energy, proceeding in parallel with rather than in competition with somatic development, influenced by genetic endowment (physiological efficiency) and environmental opportunity, and regulated by inhibition. Insights from the effects of exploitation on variation in other fishes, and on the consequent stability of their populations, are used to consider some potential implications of river management on floodplain species. Among floodplain fishes, more information is needed on genetic and spatial structure of populations, on internal and external environmental regulation of developmental timing, and on the nature of the process of inhibition of maturation, to ensure protection of the integrity of these species populations in environments being modified.
Key words: flood management, reproduction, maturation, genetic conservation.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 169-182, 2008
DOI: 10.2478/v10104-009-0013-0

World prospects for floodplain fisheries

Robin Welcomme

Imperial College, South Kensington Campus, London SW7 2AZ
e-mail: Welcomme@dsl.pipex.com

Abstract

Rivers contribute some 5 million tons of fish for human consumption, most of which comes from major floodplains. Fisheries in the tropics are over-exploited and show signs of fishing-down. Several trends are damaging river fisheries. Floodplains are being drained for irrigated agriculture, leading to modifications to their form and function. River channels are also being modified. The modifications result in the loss of some fish guilds. The growing demand for water is leading to increasing abstraction and control of flow by dams. This means that there is often insufficient water available for the functioning of the system with lessened survival of fish species and lowering of production. Flood control to curb urban and farmland flooding is exacerbating the separation of the plain from the river. Technical solutions are now well established and include the creation of protected floodplain beads in the developing landscape, and the agreement of environmental flows. Political and social application of these solutions is more difficult and calls for the application of mechanisms to incorporate fisheries interests into generalised river development plans.

Key words: Floodplain fisheries; overfishing; environmental flows; river rehabilitation

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 183-194, 2008
DOI: 10.2478/v10104-009-0014-z

The role of coastal floodplains in generating sediment and nutrient fluxes to the Great Barrier Reef lagoon in Australia.

Jim Wallace, Lachlan Stewart, Aaron Hawdon, Rex Keen

Commonwealth Scientific and Industrial Research Organisation, Division of Land and Water, Davies Laboratory, University Road, Townsville, Queensland 4814, Australia.
e-mail: jim.wallace@csiro.au

Abstract
Floodplains adjacent to the Great Barrier Reef (GBR) lagoon in Australia are sources of pollutants that may degrade this unique marine ecosystem. Much of the contaminant load is transported to the ocean in large flood events, where over bank flows are not well recorded by standard river gauges. This paper describes the estimation of flood discharge and measurements of sediment and nutrient concentrations in flood waters on the Tully and Murray floodplains in northern Queensland, Australia. These data were combined to estimate the loads of sediment and nutrient delivered to the GBR lagoon during three floods in 2007. We found that the floods made a very significant contribution (>50%) to the marine load and that there was more dissolved organic nitrogen (DON) than dissolved inorganic nitrogen (DIN). As this is the opposite of their concentrations in river water, DON loads to the ocean may be nearly twice those previously estimated from riverine data.
Key words: Floods, water quality, marine pollution

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 195-203, 2008
DOI: 10.2478/v10104-009-0015-y

Climate change impacts on the hydrological cycle

Zbigniew W. Kundzewicz

Research Centre for Agricultural and Forest Environment, Polish Academy of Sciences,
Bukowska 19, 60-809 Poznań, Poland
e-mail: zkundze@man.poznan.pl
and
Potsdam Institute for Climate Impact Research, Telegrafenberg, 14 412 Potsdam, Germany
e-mail: zbyszek@pik-potsdam.de

Abstract
Climate and water on the planet Earth are intimately linked. Water influences the climate, and is influenced by the climate. Every change in the climatic system induces a change in the water system, and the other way round. Climate change has been observed and even a stronger change is projected for the future by climate models. Discussion of changes is presented, with reference to such variables as temperature, precipitation, sea level, river flow, soil moisture, evapotranspiration, groundwater, and cryospheric characteristics. The weight of observational evidence indicates an ongoing intensification of the water cycle, with increasing rates of evaporation and precipitation. Climate change will alter the future world's freshwater resources in several aspects, such as freshwater availability, quality, and destructive potential. The likelihood of deleterious impacts, as well as the cost and difficulty of adaptation, would increase with the extent and the speed of global climate change. One of the effects of climate change is that hydrological extremes become more extreme. This leads to emergence of hot-spots and vulnerable areas, and the need for difficult adaptation. Globally, the negative impacts of climate change on freshwater systems are very likely to outweigh their benefits.
Key words: global warming; greenhouse effect; hydrological processes; change detection; model-based projections

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 205-223, 2008
DOI: 10.2478/v10104-009-0016-x

Application of the ecohydrological concept for sustainable development of tropical floodplains: the case of the upper Paraná River basin

Angelo A. Agostinho[1], Luiz C. Gomes[1], Fernando M. Pelicice[1], Edvard E.Souza-Filho[2], Eduardo A. Tomanik[3]

[1]Universidade Estadual de Maringá - Nupelia-DBI-CCB
Av. Colombo, 5790 - 87020-900 Maringá – PR – Brazil
agostinhoaa@gmail.com, lcgomes@nupelia.uem.br, fmpelicice@gmail.com
[2]Universidade Estadual de Maringá – Dept. Geografia-CCH
edvardmarilia@wnet.com.br
[3]Universidade Estadual de Maringá – Dept. Psicologia-CCH
eatomanik@gmail.com

Abstract

The degradation of natural resources in the upper Paraná River's floodplain remnant has been caused by local use of land, and by alterations in the flood regime promoted by more than 100 large reservoirs located upstream from the plain. This destruction appeared irreversible 15 years ago, although the area has been partly rehabilitated through the construction of three large conservation units that encompass the entire remnant. These units, which imposed different levels of restrictions on soil use, have resulted in clear benefits to terrestrial components. However, aquatic ecosystem function is still harmed by artificial regulation of discharge. This regulation reduces biological diversity and the resources traditionally exploited by indigenous people. In this paper, we examined the conditions of the upper Paraná River basin in detail, and we discussed the application of the ecohydrology concept to promote sustainable development in this region.

Key words: Flood control, biodiversity, reservoir, hydroecology, flood and fisheries

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 225-235, 2008
DOI: 10.2478/v10104-009-0017-9

Ecohydrology towards the sustainable development: An approach based on South American case studies

Christopher Freire Souza[1*]; Rutinéia Tassi[1]; David da Motta Marques[1]; Walter Collischonn[1]; Angelo Antonio Agostinho[2]

[1]Instituto de Pesquisas Hidráulicas, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves 9500, Porto Alegre/RS, Brazil
*e-mail: christopher.souza@yahoo.com
[2]Núcleo de Pesquisas em Limnologia Ictiologia e Aqüicultura**,** Universidade Estadual de Maringá, Av. Colombo, 5790, 87020-900 Maringá/PR, Brazil

Abstract
On the race for sustainable development, the lack of methods for achieving it is remarkable. In this paper, we discuss how eco-hydrology may guide watersheds management towards sustainability based on the evaluation of three different realities: dam cascades and conservation areas in macro basins and urban rivers exploration in a densely occupied micro-basin. A framework for managing water is proposed, followed by the presentation of prospects and challenges on its application.
Key words: Water management framework; environmental sustainability; developed and protected areas

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 237-244, 2008
DOI: 10.2478/v10104-009-0018-8

Ecohydrology for Integrated Water Resources Management in the Nile Basin

Alaa El-Sadek[1], Mohssine El Kahloun[2], Patrick Meire[2]

[1]Water Resources Management Program, College of Graduate Studies, Arabian Gulf University, P.O. Box 26671, Manama, Bahrain.
e-mail: alaasa@agu.edu.bh
[2]University of Antwerp "CDE". Department of Biology. Ecosystem Management Research Group. Universiteitsplein 1; BE-2610 Antwerp (Wilrijk), Belgium.
e-mail: Mohssine.elkahloun@ua.ac.be; Mohssine.elkahloun@belspo.be

Abstract
Within the framework of an UNESCO-FUST project "FRIEND-NILE II", the implementation of ecohydrology, as a promising discipline that can help solving the problems with water quality management is the focus objective for the participating Nile countries. In this paper, the importance of ecohydrology as a tool for integrated water resources management with focus on the Nile Delta of Egypt was discussed. Based on survey of past and ongoing research activities, it could be concluded that the effort to gain formal recognition of natural processes as explicit tools in water management will require a rather dramatic change in perspective and may be best introduced to the Nile countries through the international agreements. The results showed the importance of natural ecosystems for regulating nutrients and water cycles. At the level of implementation, natural ecohydrological processes (buffering capacity of wetlands), should be viewed as a fundamental component of more multifaceted solutions, including additional systems (constructed wetlands, buffer zones). Finally, it is strongly believed that by improving our ecohydrological understanding of natural water purification processes (data collection), new issues (ecohydrological modeling, GIS) can be used for the sustainable use of water in the Nile Basin.
Key words: FRIEND-NILE II; Nile Delta; water quality; fertilizers; wetland

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 245-262, 2008
DOI: 10.2478/v10104-009-0019-7

Resource use in the Parana River Delta (Argentina): moving away from an ecohydrological approach?

Claudio R. M. Baigún[1,6], Alba Puig[2], Priscilla G. Minotti[3], , Patricia Kandus[4], Ruben Quintana[4,6], Ricardo Vicari[4], Roberto Bo[4], Norberto O. Oldani[5,6], John A. Nestler[7]

1. IIB-INTECH, Camino de Circunvalación Laguna Km 6, 7130 Chascomús, Argentina
e-mail: cbaigun@yahoo.com
2. Museo Argentino de Ciencias Naturales, Angel Gallardo 470, 1405 Ciudad de Buenos Aires, Argentina
3. Universidad CAECE, Dpto. Biología, Junín 516, 1026 Ciudad de Buenos Aires, Argentina
4. GIEH, Universidad de Buenos Aires, FCEN, Dpto. Ecología, Genética y Evolución, Ciudad Universitaria, Pabellón II, 1428 Ciudad de Buenos Aires, Argentina
5. Centro Científico Tecnológico. Güemes 3450, 3000 Santa Fe, Argentina
6. Consejo Nacional de Investigaciones Científicas y Tecnológicas
7. US Army Engineer Research and Development Center, Vicksburg, Mississippi, USA

Abstract

The Parana Delta region is a huge mosaic of wetlands exhibiting rich biodiversity highly adapted to annual hydrological cycles. In the last decade, however, flow patterns have changed due to the combined effect of dam regulation in the upper basin, waterway construction, new road infrastructure, and climate changes. Such changes triggered new strategies for cattle, fisheries, wildlife and forestry uses with associated landscape modifications and are directed to transform the Delta into a productive dryland area. Such vision fails to envision the value of wetland benefits and environmental services and how traditional resource management can be more sustainable in the long term. We conclude that an ecohydrological template is needed to guide future development, where economic, social and environmental factors should be harmonized.

Key words: floodplain, ecological integrity, flow pulse, environmental goods and services

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 263-272, 2008
DOI: 10.2478/v10104-009-0020-1

Management of floodplain's water bodies ecosystems on impounded rivers

Vladimir Timchenko, Oleg Timchenko, Nataliya Lukashenko

Institute of Hydrobiology of Ukrainian National Academy of Sciences,
Prosp. Geroyiv Stalingrada, 12, 04210, Kyiv, UKRAINE
e-mail: timol@iptelecom.net.ua

Abstract
The model of management of ecosystem of floodplain water bodies of regulated rivers has been elaborated. The basic assumption is water regime in the river sections of reservoirs regulated by the releases of hydroelectric power stations (HEPS). The influence of external and internal water exchange, determined by the operating conditions of HEPS, on the dynamics of the main integral characteristics, including the content of dissolved oxygen and easily oxidized organic matter in the water, forms the basis of the model. The verification of the model was carried out under field conditions in numerous floodplain water bodies of the Dnieper River (Ukraine). The empirical equation, which describes influence of the morphological characteristics of arms connecting water bodies with the main channel on external water exchange of water bodies, is given in the paper. It can be used for the improvement of the ecological conditions of floodplain water bodies.
Key words: connected network, water exchange, state of ecosystems

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 273-280, 2008
DOI: 10.2478/v10104-009-0021-0

Management approaches to floodplain restoration and stakeholder engagement in the UK: a survey

Tom Ball

School of Social and Environmental Sciences (Geography) and UNESCO Centre for Water Law, Policy and Science, University of Dundee, Perth Road Dundee DD1 4HN, UK.
e-mail: t.ball@dundee.ac.uk

Abstract
This paper reviews selected floodplain restoration projects in the UK that have generated data for flood peak reduction and/or, water quality benefits and ecological improvement. The objective was to examine their effectiveness, both in terms of environmental improvement and the decision making of the planning and stakeholder groups that led to their implementation. For riparian zone reforestation, modelling shows that benefits from flood risk reduction are obtained at large scales due mainly to increases in floodplain surface roughness. However, little conclusive proof has been uncovered for benefits, *solely* in terms of flood risk reduction, on smaller scales. Alternative benefits such as diffuse pollution reduction, with benefits for ecological status targets, often provide better rationales at such scales. Success is realised when the multiple benefits of restoration programmes are clearly communicated and key stakeholders and landowners involved from the planning stage.
Key words: flooding, land use, wetlands, forestry, adaptive management.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 281-289, 2008
DOI: 10.2478/v10104-009-0022-z

Flood sediment deposition and phosphorus retention in a lowland river floodplain: impact on water quality of a reservoir, Sulejów, Poland

Edyta Kiedrzyńska[1], Marcin Kiedrzyński[2], Maciej Zalewski[1,3]

[1]International Institute Polish Academy of Sciences, European Regional Centre for Ecohydrology under the auspices of UNESCO, 3 Tylna Str., 90-364 Łódź, Poland, e-mail: edytkied@biol.uni.lodz.pl;
[2]University of Łódź, Department of Geobotany and Plant Ecology, 12/16 Banacha Str., 90-237 Łódź, Poland;
[3]University of Łódź, Department of Applied Ecology, 12/16 Banacha Str., 90-237 Łódź, Poland.

Abstract

The better understanding of the flood deposition and nutrient retention in a river floodplain is needed. This paper presents a quantification of these processes for the reduction of the phosphorus load transported by the Pilica River during floods to the lowland reservoir in the central region of Poland.

Deposition of flood-derived Suspended Particulate Matter (SPM) at the floodplain surface was determined using sedimentation traps. A Digital Terrain Model (DTM), an inundation model of the floodplain were used to evaluate the capacity of the floodplain to flood sediment deposit and retain P.

In the Pilica River floodplain, the mass of fine-grain flood sediments amounts to an average of 84.8 g m^{-2}. The phosphorus (P) content of fine-grain flood sediments averaged to 3.3 mg g^{-1} (d.w.). The sedimentation in the experimental Pilica River floodplain reduces the transport of flood sediments (25.3 t yr^{-1}) and P (mean 38.2 kg $floodplain^{-1}$ yr^{-1}) to the reservoir and that's why contribute to reduction of symptoms of eutrophication.

Key words: catchment-floodplain-river system, floodplain wetlands, flood sedimentation, phosphorus retention, river self-purification, Pilica River.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 291-306, 2008
DOI: 10.2478/v10104-009-0023-y

Ecological and hydrological functions of the biggest natural floodplain in Latvia

Artūrs Škute[1], Dāvis Gruberts[2], Juris Soms[2], Jana Paidere[2]

[1]Institute of Ecology, Daugavpils University, Vienibas 13, LV 5401, Daugavpils, LATVIA
e-mail: arturs.skute@du.lv
[2]Department of Geography, Daugavpils University, Parades 1, LV 5401, Daugavpils, LATVIA

Abstract

The biggest natural floodplain in Latvia is located within the Daugava valley stretch from Daugavpils City down to Jersika, where the river cuts through the Baltic Morainic Ridge and in its further course flows across the Eastern Latvian lowland. The territory of the floodplain which is outlined by the highest spring flood level encompasses 208.25 km^2. This territory reduces the risk of severe flooding further downstream by accumulating a significant proportion of the Daugava maximal runoff, reducing the magnitude of the flood pulse by 3-4 meters. In addition, the floodplain accumulates a large amount of suspended and dissolved matter, which, in turn, stimulates productivity of floodplain meadows, wetlands and lakes. The NATURA 2000 site is also located in this floodplain.

Key words: River-floodplain interactions, hydrology, phytoplankton, zooplankton, biodiversity, climate change

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 307-315, 2008
DOI: 10.2478/v10104-009-0024-x

Environmental flow regime in the framework of integrated water resources management strategy

Yesid Carvajal-Escobar

Research Group in Water Resources Engineering and Development of Soils (IREHISA), School of Natural Resources Engineering and Environment (EIDENAR). Universidad del Valle, Calle 13 No. 100 -00. Blding 344. Office 1013. Cali, Valle of the Cauca - COLOMBIA
e-mail: yecarvaj@univalle.edu.co

Abstract
The so-called water crisis, recognized as an important issue in our times, is the result of several situations including demographic growth, water, soil and air pollution, catchment deforestation and increasing land and water-use conflicts. The effects of climatic variability and climate change on human beings and on the aquatic and terrestrial ecosystems increase this crisis. The real and apparent conflicts existing between human and ecosystem water needs have increased the need to implement an alternative model for integrated water resources management (IWRM), of wide acceptance and use on a global scale. Environmental flow, a concept from the IWRM approach, has great potential in this type of conflict resolution; and it can be implemented at the catchment level. Nevertheless, there is not yet an agreement regarding terminology and concepts or assessment methodologies. The following paper purports to show the general context of water resources and to review the state of the art of environmental flow, including terminology, conceptual approaches, assessment challenges and its important role in the conservation of vulnerable ecosystems. Finally, conclusions and recommendations are presented.
Key words: Water in Latin America, water conflicts, environmental flow, conceptual approaches.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 317-329, 2008
DOI: 10.2478/v10104-009-0025-9

Using three-dimensional visualization to represent hydrological influence on wetland plants

Yun Pan[1], Nobukazu Nakagoshi[1], Huili Gong[2, 3]

[1]Graduate School for International Development and Cooperation, Hiroshima University, Higashi-Hiroshima, 739-8529, Japan
e-mails: panyun86@hotmail.com; nobu@hiroshima-u.ac.jp
[2]MOE Key Lab of 3D Information Acquisition and Application, Capital Normal University, Beijing, 100037, China
[3]Beijing Key Lab of Resource Environment and GIS, Capital Normal University, Beijing, 100037, China
e-mail: gonghl@263.net

Abstract
Wild Duck Lake (WDL) wetland, a Nature Reserve of Beijing, China is suffering from regional groundwater table declining and potential flood inundation. This paper aims to visualize the hydrological influence on plant species in this area. The photo-realistic plants were rendered at 3D scale with exact georeferencing on the Digital Elevation Model (DEM) covered with an aerial photo. The simplified relationship between plants and hydrology was established according to the field survey of individual height, population density, depth to shallow groundwater table, and depth to surface water level. Seed-spread algorithm was used to simulate flood inundation with a given flood level. Plant species with the influenced individual height and population density were then represented according to specified shallow groundwater table and flood level. Navigation, animation and some other 3D handling tools were developed to improve interactive and immersive abilities for exploring. The result shows that 3D visualization can be an effective way to understand interaction between hydrology and ecology, which usually hides behind of some complicated and interdisciplinary processes. It provides us a visual decision-making support for water resource management on considering of ecological response.
Keywords: photo-realism; groundwater; flood simulation; remote sensing; GIS; Visual C++.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 331-337, 2008
DOI: 10.2478/v10104-009-0026-8

Hydrodynamic model of the Lower Biebrza River flow - A tool for assessing the hydrologic vulnerability of a floodplain to management practices

Dorota Świątek, Sylwia Szporak, Jarosław Chormański, Tomasz Okruszko

Department of Hydraulic Engineering and Environmental Restoration, Warsaw University of Life Sciences - SGGW, 159 Nowoursynowska Str, 02-786 Warsaw, Poland
e-mail: D.Swiatek@levis.sggw.pl

Abstract

Floodplains are complex and dynamic ecological systems, and two important components of these systems, the hydrology and vegetation are closely linked. The aim of this work was evaluation of influence of the changes in vegetation structure on the flood extent in the floodplain. The study area was the Lower Biebrza Basin, fairly undisturbed river-marginal peatland, located in the north - eastern Poland. The flood extent and average flood depth were determined by GIS analysis in combination the level calculated by hydrodynamic model with the Digital Elevation Model of the floodplain. Different scenarios of land use with actions like grazing or mowing, scrub and trees cutting, and secondary succession were analyzed. Obtained results show that the variation of the flood extent is strongly related to the vegetation structure of the floodplain, and the applied approach enables a quantitative analysis of a flooded area magnitude.

Key words: floodplain flow modelling, wetland, GIS analysis, the Biebrza valley

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 339-361, 2008
DOI: 10.2478/v10104-009-0027-7

Hydraulic geometry and microtopography of tidal freshwater forested wetlands and implications for restoration, Columbia River, U.S.A.

Heida L. Diefenderfer[12], André M. Coleman[3], Amy B. Borde[1], Ian A. Sinks[4],

[1]Pacific Northwest National Laboratory, Marine Sciences Laboratory, 1529 West Sequim Bay Road, Sequim, WA 98382, U.S.A.
e-mails: heida.diefenderfer@pnl.gov; amy.borde@pnl.gov
[2]University of Washington, College of Forest Resources, Seattle, WA 98195, U.S.A.
[3]Pacific Northwest National Laboratory, 3200 Q Avenue, K9-33, Richland, WA 99352, U.S.A.
e-mail: andre.coleman@pnl.gov
[4]Columbia Land Trust, 1351 Officers' Row, Vancouver, WA 98661, U.S.A.
e-mail: isinks@columbialandtrust.org

Abstract
In many coastal areas, diking has severed the lateral connectivity between river channels and tidal freshwater floodplain forests that, historically, were shaped by riverine and oceanic hydrologic processes and local surficial geology. This paper assesses geomorphological aspects of *Picea sitchensis* (Sitka spruce) reference wetlands and restoration sites on the West Coast of North America. Multi-scale methods from fluvial and estuarine sciences included field surveys and spatial analysis of Light Detection and Ranging (LiDAR) data. At reference wetlands, correlations between channel cross-sectional area at outlet and catchment-scale features (catchment area, total length of channels) were consistent with previously published hydraulic geometry of two tidal salt marsh systems. Hydrologic reconnection restoration actions on agricultural lands – dike breaching, culvert installation, and tide gate replacement – all affected channel cross-sectional geometry. Diked land had subsided and lost microtopographic features associated with large wood during agricultural use, while channel density remained comparable to reference wetlands. Thus, at restoration sites, a greater area-time inundation index and frequency of inundation increased both sedimentation rates and channel cross-sectional areas when compared to reference wetlands. Such site-scale restoration affects ecosystem processes and produces measurable patterns in hydraulic geometry and channel morphology.
Key words: tidal channel, ecological restoration, *Picea sitchensis,* roughness index, dike, large woody debris, geomorphology

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 363-373, 2008
DOI: 10.2478/v10104-009-0028-6

Lateral disperal and displacement of fish during flood events in lowland river systems in the UK– implications for sustainable floodplain management

Graeme Peirson[1], Jonathan David Bolland[2], Ian Cowx[2]

[1]Environment Agency, Mance House, Hoo Farm Industrial Estate, Kidderminster DY11 7RA, England, UK.
e-mail graeme.peirson@environment-agency.gov.uk
[2]Hull International Fisheries Institute, University of Hull, Hull, East Yorkshire, HU6 7RX, UK
e-mail: J.Bolland@hull.ac.uk; I.G.Cowx@hull.ac.uk

Abstract
During summer floods, significant numbers of juvenile and adult fish became stranded in the floodplains of English lowland rivers. These mortalities were only observed in areas where floodbanks or other features prevented fish returning to the river in receding floodwaters. These phenomena support the view that even in river systems that lost their floodplain functionality centuries ago, fish communities still retain the need and the ability to utilise floodplain habitats when they become available. The significance of fish losses during flood events in managed lowland rivers is discussed in relation to ecological status, to climate change and to options for application of ecohydrological principles to flood risk management and floodplain rehabilitation
Key words: cyprinid, England, floodplain levees, rehabilitation, stranding

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 375-384, 2008
DOI: 10.2478/v10104-009-0029-5

Fish assemblage of restored Al-Hawizeh marsh, Southern Iraq

Abdul-Razak M. Mohamed[1*], Najah A. Hussain[2], Sajed S. Al-Noor[1], Falah M. Mutlak[3], Ibrahim M. Al-Sudani[1], Ahmed M. Mojer[1], Abas J. Toman[3], Mohamed A. Abdad[1]

[1]Department of Fisheries and Marine Resources, College of Agriculture, University of Basrah, Iraq
[*]E-mail: abdul19532001@yahoo.com
[2]Department of Biology, College of Science, University of Basrah, Iraq
[3]Marine Science Centre, University of Basrah, Iraq

Abstract

Al-Hawizeh marsh is one of the largest wetlands in south Iraq. During last two decades, 65% of a permanent marsh was drained and it led to a substantial loss of native aquatic flora and fauna. The marsh was reflooded in April 2003. The characteristics of fish assemblage in this marsh were described after three years of the restoration. A total of 4715 fishes of 15 species were caught since October 2005 to September 2006, using different fishing gears. The fish species in the marsh were divided into resident, seasonal and occasional groups. *Liza abu* was the most abundant species comprising 37.1% of the total numbers followed by *Barbus luteus* (29.4%), *Carassius auratus* (15.3%), *Alburnus mossulensis* (4.88%) and *Aspius vorax* (4.14%). Fish species diversity index ranged from 0.88 to 2.1, richness from 0.73 to 2.42 and evenness from 0.49 to 0.85. The diet varied among the fish species, most of them depended on two or three major food items. Several cyprinid species disappeared from the restored marshes or decreased in their abundance. This could be related to reduced water supply and effectively eliminated the spring flood pulses that sustained wetland ecosystems in the lower Tigris-Euphrates basin. Increase of salinity, scarcity of benthic food resources and competition with alien/introduced species have also detrimental effects on native cyprinid fishes.

Key words: Species compositions, alien species, diversity indices, food habits, Mesopotamia wetlands.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 385-389, 2008
DOI: 10.2478/v10104-009-0030-z

The importance of unsaturated soil zone for the regional water balance

Othmar Nestroy

Institute of Applied Geosciences, Graz University of Technology, Rechbauerstrasse 12,
A - 8010 Graz, Austria
e-mail: o.nestroy@tugraz.at

Abstract
Studies of the soil water balance, especially the function of the unsaturated soil zone, infiltration rate was made on two very different sites: Marchfeld (Vienna basin, 170 m asl, 550 mm precipitation and 9.5°C mean annual temperature), and in the Radstädter Tauern (Country of Salzburg, 1600 m asl. 1500 – 2000 mm precipitation, 2-5°C mean annual temperature).
The results demonstrate the big influence of human activity - like intensive agriculture or exaggerated creation of ski slopes - in positive sense: a sustainable land management in the Marchfeld, and negative sense: a decrease of the water capacity due the destroying of the topsoil.
Key words: soil water balance, infiltration rate, unsaturated zone, Marchfeld, Obertauern.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 391-399, 2008
DOI: 10.2478/v10104-009-0031-y

Hydrogeology and vulnerability of limited extension fissured rocks islands

George C. Stournaras

Faculty of Geology and Geoenvironment ,University of Athens, Panepistimioupolis Zografou, 15784 Athens, Greece
e-mail: stournaras@geol.uoa.gr

Abstract
The fissured rocks present their own hydrogeologic characters, maintained in the field of Ecohydrology. Furthermore, the relation between the geological abiotic environment and the living organisms represent a continuous and strong interaction. The fissured rocks represent a homogeneous and anisotropic media, while the density and magnitude of the discontinuities allow their consideration as porous or karstic media. Regarding the vulnerability assessment and risk mapping the occurred particularities derive from the internal structure of the media. Those particularities concern the groundwater alimentation, discharge protection and management, as well as the pollutants transportation and confrontation. The internal structure of the media (discontinuities characteristics) is accomplished by the hydraulic connection with special geoforms such as wetlands, floodplains etc.
Key words: Fissured rocks, vulnerability, geoforms, Hellas

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 401-410, 2008
DOI: 10.2478/v10104-009-0032-x

Distribution of ectomycorrhizal fungi in periodically inundated plant communities on the Pilica River floodplain

Beata Sumorok[1] , Krzysztof Kosiński[2], Dorota Michalska-Hejduk[3], Edyta Kiedrzyńska[4]

[1]Research Institute of Pomology and Floriculture, Rizosphere Laboratory, 18 Pomologiczna str., 96-100 Skierniewice, Poland, bsumorok@biol.uni.lodz.pl
[2]University of Łódź, Department of Applied Ecology, 12/16 Banacha str., 90-237 Łódź, Poland;
[3]University of Łódź, Department of Geobotany and Plant Ecology, Banacha 12/16 str., 90-237 Łódź, Poland;
[4] International Institute of the Polish Academy of Sciences European Regional Centre for Ecohydrology under the auspices of UNESCO, 3 Tylna str., 90-364 Łódź, Poland.

Abstract
Studies on ectomycorrhizal symbionts in plant communities were developed in the experimental floodplain located in the middle reach of the Pilica River valley near Sulejów (central Poland). This area is a natural floodplain where habitats are permanently or periodically flooded. Its vegetation is highly diversified and includes hay-growing meadows (*Molinio-Arrhenateretea*), rush communities (*Phragmitetea, Caricetea*), willow shrubs (*Salicetea*) and pine monoculture. Samples of trees' and bushes' roots were collected using a metal probe, sporocarps of ectomycorrhizal fungi (ECMF) were collected together. Researches indicate that wet soil conditions and periodic flooding have a significant influence on mycorrhiza presence. The vast majority of ectomycorrhizal fungi were present in trees growing in dry habitats – willow bushes and pine monoculture (*Salix* species, *Betula pendula* and *Pinus sylvestris*). The species composition were determined - in total noted c.a. 40 species of ectomycorrhizal fungi and 15 morphological types. The number and diversity of ectomycorrhizal (ECM) morphotypes increased significantly from flooded to dry habitats. Despite the fact that extremely humid and dry soil conditions make a negative impact on mycorrhiza, symbiotic parthnership enable floodplain plant communities to tolerate water level fluctuations, eliminate water stress and provide plants tissues with e.g. phosphorous.
Key words: water-logging, plant cover, mycorrhizae.

full text
back to contents

Ecohydrol. Hydrobiol. 8 (2-4), 411-418, 2008
DOI: 10.2478/v10104-009-0033-9

The role of islands in maintaining the connectivity of habitat for mammals in middle Vistula river valley

Jerzy Romanowski, Dorota Dudek, Kamila Kowalczyk

Centre for Ecological Research, Polish Academy of Sciences, Dziekanów Leśny, 05-092 Łomianki, Poland
e-mail: romanowski@cbe-pan.pl

Abstract

Live trapping and tracking was used to evaluate mammalian species richness, and habitat modelling to assess the connectivity of habitats for three rodent species in the 90 km long fragment of the Vistula valley, one of the few large European rivers preserved in semi-natural state. Our results revealed the differences between local population dynamics of Bank vole *Myodes glareolus*, Yellow-necked mouse *Apodemus flavicollis* and Striped field mouse *Apodemus agrarius* on the island and the bank. The LARCH model outputs indicated the potential for large viable populations of these species in the study area. The analysis showed that island habitats of modelled species were part of well connected sustainable network in the valley. Islands and patches of riparian forests on river banks facilitate dispersion and provide functional continuity of the Vistula corridor for mammals. The habitat management options analysis demonstrates potentially negative effects of river regulation on the spatial cohesion of habitats for mammals.

Key words: rodents, corridor, population viability, riparian forest, scenario analysis.

full text
back to contents