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Ecohydrology - the use of water and ecosystem processes for healthy urban environments

Maciej Zalewski, Iwona Wagner

European Regional Centre for Ecohydrology under the auspices of UNESCO, 3 Tylna str., 90-348 Łódź, Poland,

Department of Applied Ecology, University of Łódź, 12/16 Banacha str., 90-237 Łódź, Poland
e-mails: mzal@biol.uni.lodz.pl; iwwag@biol.uni.lodz.pl

Abstract

Water in the urban space has been considered up to now mostly from the perspective of water supply, sewage purification and storm water management, with increasing awareness of the necessity of freshwater ecosystems conservation. However there has been little holistic consideration of the freshwater and terrestrial ecosystems for moderation and control of the hydrological cycle in the city.

Ecohydrology principles provide a new framework for urban water management where the use of ecosystem properties as an integrating management tool should serve to reduce hydro peaking, improve storm water quality and retention, and convert excess nutrients, pollutants and even sludge in to biomass/bioenergy. In parallel the enhancement of fresh water and green areas in the city space improves human health and quality of life.

Key words: Urban ecosystem, freshwater, ecohydrology, Łódź City demonstration project.

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Aquatic habitat issues in urban stormwater management: challenges and potential solutions

Jiri Marsalek, Quintin Rochfort, Lee Grapentine

National Water Research Institute, 867 Lakeshore Road, Burlington, Ontario, Canada L7R 4A6
e-mails: Jiri.marsalek@ec.gc.ca, Quintin.rochfort@ec.gc.ca, Lee.grapentine@ec.gc.ca

Abstract

Urban stormwater management practices impact existing aquatic habitats and create new ones in stormwater ponds and wetlands. The former case is reviewed and discussed with respect to habitat structure, flow regime, water quality, food sources, and biotic interactions. The latter case is documented by a case study of a stormwater management facility in the Toronto area. The study found that the quality of habitat created in the facility was poor, because of chemical contamination of water and sediment accumulated in the facility. Such contamination could have been avoided by the implementation of pollution source controls, which were recommended in the original design.

Key words: Aquatic habitat; Biological communities; Macroinvertebrates; Stormwater management; Toxicity bioassays; Urbanization; Water and sediment pollution

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Aquatic habitats in Vienna (Austria) – integrating ecology and urban water management

Georg A. Janauer

Department of Freshwater Ecology, University of Vienna, Althanstrasse 14, A – 1090 Vienna, Austria.
e-mail: georg.janauer@univie.ac.at

Abstract

Vienna is an urban complex of about 1.5 milion people. The entire urban water management – drinking water supply, sewage collection and treatment, flood control and the condition of the Danube River Wetlands – is highly functional. Internal co-operation between administration units concerned with different aspects of water management provides the basis for successful problem-solving. Examples of the resilience of aquatic systems, of rehabilitation after cyanobacterial impacts and for possible dangers to the UNESCO biosphere reserve, show how ecohydrological practices make ecosystem services available to the inhabitants of Vienna.

Key words: public administration, floodplain waters, river regulation, drinking water supply, sewage treatment

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The paradoxical ecology and management of water in the Phoenix, USA metropolitan area.

Elisabeth K. Larson[1], Nancy B. Grimm[1,2], Patricia Gober[2,3], Charles L. Redman[2]

[1]School of Life Sciences,
[2]Global Institute of Sustainability,
[3]Decision Center for a Desert City,
PO Box 874601, Arizona State University, Tempe, AZ, 85287-4601 USA
e-mail: eklarson@asu.edu

Abstract

One of the fastest growing cities in the US, the desert city of Phoenix has appropriated significant surface and ground-water resources from regions near and far to support not only basic needs but also various cultural amenities, such as golf courses. Rapid expansion of the metropolitan area has resulted in loss of native ecosystems including desert riparian areas, and creation of new, designed ecosystems that are frequently water-intensive. This article reviews current water resources and management practices, along with resultant ecological impacts. Future legal, socioeconomic, cultural, and environmental challenges to the sustainability of the current lifestyle are highlighted.

Keywords: urban ecology, sustainability, aquatic habitat, Arizona, semi-arid ecosystem.

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An audit of the ecological implications of remediation, management and conservation projects involving urban aquatic habitats in Cape Town, South Africa, with reference to their social and ecological contexts.

[1]Elizabeth Day; [1]Geordie Ractliffe, [2]Julia Wood

[1]The Freshwater Research Unit; Zoology Department; University of Cape Town; Rondebosch 7700, Cape Town; South Africa. lizday@mweb.co.za
[2]Nature Conservation Directorate; City of Cape Town; Cape Town; South Africa

Abstract

Case studies of a number of river and wetland projects, involving manipulation of the structure or functioning of these urban habitats are presented in this paper. The assessed systems were all located within Cape Town – a city in the heart of the Cape Floristic Region of the Western Cape of South Africa and as such, an area of exceptionally high biodiversity, with rapid urban growth, limited developable land, and where social priorities often take precedence over habitat conservation. The practical implications of social and economic frameworks in constraining the design and successful implementation of restoration, rehabilitation and remediation activities in wetland and river management are discussed. In many cases, social expectations (e.g. desire for specific amenity attributes) or security issues limit rehabilitation potential, while successful project implementation requires an understanding of social and economic frameworks. Recommendations for different levels of habitat conservation or utilisation are also made, taking cognisance of the variable sensitivity and biodiversity importance of aquatic ecosystems,

Key words: Biodiversity; urban river rehabilitation; wetland conservation; fynbos

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The Urban Biosphere Reserve (UBR) concept for sustainable use and protection of urban aquatic habitats: case of the Omerli Watershed, Istanbul

Azime Tezer

Istanbul Technical University (ITU), Urban and Regional Planning Department, Taskisla, Taksim / Istanbul 34437 Turkey
tezera@itu.edu.tr

Abstract

Water quality is completely dependent on healthy ecosystems and sustainable land use management in watersheds. Conservation of riparian and aquatic habitats is the primary task to balance natural and socio-environmental interactions. The Omerli Watershed (OW) is the most important of seven watersheds that provide drinking water to Istanbul, a megacity with over 10 million people by 2000. Urban development in Istanbul has been taking place in and around its drinking water sources. The OW faces the most acute, unplanned pressures of urbanization on water quality and biological diversity, creating unsustainable development. The OW has been proposed to UNESCO as an Urban Biosphere Reserve (UBR) in an attempt to reconcile urban development, water quality and biodiversity conservation in a more sustainable way.

Keywords: UNESCO MAB Program, biodiversity, biosphere reserves, watersheds, Istanbul.

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Model and tools for the integrated management and planning of the "river – fluvial corridor" system

Maria Giovanna Braioni[1], Anna Braioni[2], Salmoiraghi Gianpaolo[3]

[1]University of Padova, Department of Biology, Via U. Bassi 58/B Padova Italy
e-mail: braioni@mail.bio.unipd.it
[2] Architect, Vicolo Ponte Nuovo 9, 37126 Verona Italy, e-mail: anna.braioni@libero.it
[3]University of Bologna, Department of Evolutionary Biology, Via Selmi 2, 40126 Bologna Italy
e-mail: gian.salmoiraghi@unibo.it

Abstract

The model and the tools for integrated management and planning of the "river – fluvial corridor" system have been applied on natural and high human density river basins in the Alpine and Italian Ecoregions, characterized by different river – fluvial corridor typologies, morphology, vegetation, hydrology, and uses. In this paper we synthetically describe the latest version of the ecological and environmental landscape complex indices we used and some results obtained by the application of the model as example of integration of the data in function of the management and planning.

Key words: Buffer Strip Index, Wild State Index, Environmental Landscape Index, River – Fluvial Corridor System, Quality –Degrade – Risk Map, Soil uses planning, Integrated management and planning

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Technical and legal aspects of stormwater management in the Łódź urban agglomeration

Marek Zawilski

Technical University of Łódź, Department of Environmental Engineering al. Politechniki 6, 93-590 Łódź, Poland
mrkzaw@mail.p.lodz.pl

Abstract

Management of urban stormwater should consider many aspects including technical and legal ones. In the Łódź agglomeration these problems are clearly visible. Implementation of the traditional combined and separate sewerage systems caused the well known problems – overloading of both sewerage systems and local receiving waters. Lack of free space in the city area forces the engineers and city authorities to locate most of stormwater management facilities along receiving waters, i.e. urban rivers. Application of non-standard solutions using natural hydro-ecological methods is an attractive alternative to standard technical facilities, and such an approach is capable of obtaining high quality of flowing water in urbanized areas.
Keywords: Stormwater management; urbanization; Water Law; Hydraulic safety of receiving waters.

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Research trends in economics of environment protection related to water management

Małgorzata Burchard–Dziubińska

Institute of Economics, University of Łódź, 90-214 Łódź, Rewolucji 1905r. 41
e-mail: malbur@uni.lodz.pl

Abstract

Economic theories have been surveyed from the point of view of their usefulness to answering the question why unfavourable changes in water ecosystems, leading to upsetting of the bases of their sustained use, are observed world-wide. From the economic point of view, there are several reasons for the arising and intensifying difficulties with maintaining of natural, economic and social value of waters. They result from the market failure, the state failure and of the underdevelopment of institutional and organisational forms of environment protection. Theories of property rights, of externalities and of public goods are presented. The text also discusses methodological and practical problems related to the evaluation of values of the natural environment. The weakness of the state in assuring protection of waters is presented in terms of institutional economy. Building institutionally-organizational frameworks ensuring the sustainable use of water ecosystems is a complicated and long process, specially if the resistance of some interest groups has to be overcome. Rent-seeking and ordinary corruption are dangerous to the effective water management under different circumstances, both in developed and developing countries.

Key words: economics and institutions of environmental protection, water management.