

## FOREWORD

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Ecologically healthy urban landscapes that include wetlands and natural areas can help maintain biodiversity, water quality, and water quantity, and fulfill human aesthetic, recreational, and other social needs. Although wetland scientists and managers have worked to increase public awareness of the importance of urban wetlands for over a decade, in recent years, we have seen a weakening of regulations for wetland protection in the U.S., and in many urban areas, wetlands continue to be lost to development. The four papers that follow in this special section were presented at the conference “Urban Wetlands: Sustaining Multiple Functions” held in Portland, Oregon, May 20–21, 2002. The goal of this conference was to provide an opportunity for leaders in research on urban wetlands to summarize and synthesize the state of our knowledge of wetlands and their functions in the urban landscape from both disciplinary and interdisciplinary perspectives and to identify key directions for future research and action. Here, we place the papers presented at the urban wetlands conference in the context of research needs identified at the conference and in the literature, and we suggest some future directions for urban wetlands research.

Wetlands and associated riparian areas are valuable components of urban ecosystems, and they make up a substantial proportion of the open space in most cities or metropolitan regions. For example, even in a highly urbanized region of the U.S., such as New Jersey, about 23% of the state (~4400 km<sup>2</sup>) is protected as open space, and wetlands still cover about 4070 km<sup>2</sup>, or 19% of the state (Ehrenfeld 2004). In the Minneapolis-St. Paul Metro Region of Minnesota, (~7707 km<sup>2</sup> in area), in which Galatowitsch et al. (1999) and Nassauer (2004) have studied wetland restoration, parks and open space comprise 8.6% of the seven-county Metro region (Metropolitan Council 2003), whereas open water and other wetland types comprise 6.5% and 12%, respectively. In the Portland Metro region of Oregon, where Kentula et al. (2004) have done much of their research, about 7% of the 1200 km<sup>2</sup> Metro region is protected as open space. Riverine wetlands and non-riverine wetlands make up 5% and 2%

of the area within the Portland Metro boundary, respectively (Portland Metro 2003).

Despite regulation and efforts at protection, recent research (Schmid 1994, Azous and Horner 2000, Kentula et al. 2004) shows continued trends of loss and degradation of urban wetlands and continued controversy and conflict over regulation. Although participants at our urban wetlands conference noted some signs of improved understanding and stewardship of wetlands in the past 10–20 years (CWEST 2003), current levels of public recognition of and appreciation for the ecosystem services provided by wetlands do not ensure adequate protection. In addition, the value of urban wetlands as perceived by people who reside in urban areas and their value in providing services to the urban ecosystem are both difficult to quantify (Boyer and Polasky 2004).

Although the public most often encounters wetlands in urban settings, urban wetlands have received much less research attention than those in agricultural or relatively pristine settings. For example, analysis of keywords in the online database for the journal *Wetlands* (SWS 2002) showed that fewer than 2% of the articles published in *Wetlands* in the past 20 years address urban wetlands. Despite recognition of the need for and utility of interdisciplinary research for wetlands (Wilcox 1987, Kusler et al. 1988, Richardson 1994), only a few research groups have attempted or accomplished such research (Holland et al. 1995, Galatowitsch et al. 1999, Ehrenfeld 2004, Kentula et al. 2004). Particularly rare is research that includes social science along with traditional “hard sciences” (e.g., hydrology, geochemistry, biology). Nassauer (2004) and her colleagues (Galatowitsch et al. 1999) are unique in actively integrating social science research with biological, physical, and geochemical research on urban wetlands. Investigations of interactions among functions are only beginning to be addressed quantitatively (Ehrenfeld 2004).

Publications on urban systems (Grimm et al. 2000, Pickett et al. 2001) distinguish “ecology in cities” (the study of ecological structure, function, biota in urban settings) from “ecology of cities” (a systems approach

to the study of entire metropolitan areas from an ecosystems perspective). Much of the research on urban wetlands resides in the former realm. However, studies of "ecology in cities" can help frame the important questions and form the foundation for a systems approach to research on the ecology of urban systems ("ecology of cities"), including research on urban wetlands. Both the literature (Wilcox 1987, Bedford and Preston 1988, Richardson 1994) and attendees of our 2002 conference (CWEST 2003) have identified a need for interdisciplinary, landscape-scale research specific to urban wetlands in order to understand the complex, interactive nature of urban systems. We believe that research on urban wetlands as integral components of urban ecosystems could provide a focus for a systems approach to urban ecology that would be of value both to applied and theoretical ecology (Santelmann et al. 2003).

In the past, researchers have focused on comparisons of urban wetlands with reference wetlands outside urban areas, with the implicit goal of restoring wetlands to "pristine" or "pre-settlement" conditions. This may not be realistic or even desirable in urban settings. Nassauer (2004) suggests that urban wetland restorations may be more culturally sustainable if they focus on restoration to reference conditions for selected ecological functions and also include recognizable landscape characteristics that are culturally valued. Because humans are an integral part of urban systems, urban wetland research must directly address the need for improved understanding of the human dimension of wetland function in urban landscapes. Such research should also include input from regional planners and agency personnel and be designed to provide guidance to planners, agencies, and communities interested in wetlands as one component of healthy urban ecosystems. Many or all of the wetland functions discussed in the papers of this special section interact in complex ways. Thus, a comprehensive, interdisciplinary approach to urban wetland research could provide both an opportunity to advance our understanding of systems ecology and to generate guidelines useful to planners, managers, and policy makers.

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