

Preface

Why do we need a book on multiple stressors in river ecosystems?

Well, first of all, no book has yet been written! This comes as a surprise, as it is quite clear that stressors rarely occur alone in the environment, particularly in river ecosystems, where they often act jointly to produce complex responses. Direct and indirect feedback between stressor effects result in interactions that range from synergistic to antagonistic and may produce ecological surprises. At the same time, ecosystems differ in their resistance and resilience to stressors, and they can show thresholds beyond which critical shifts occur between ecosystem states. Even more so—and this is extending the domain of typical considerations in the field—multiple stressors can affect the biodiversity and function of river ecosystems and consequently have an impact on the goods and services that societies derive from rivers. It is therefore time for a joint analysis and realistic appraisal of natural and human-driven stressors.

The creation of this book was triggered by acknowledging the existence of three main knowledge gaps: (i) adopting a multistressor perspective to assess current and future anthropogenic impacts on river ecosystems, in contrast to the current dominance of studies that usually focus on only one or several stressors at once; (ii) integrate the ecological studies of multiple stressors in rivers with socioeconomic studies so that the research findings can be placed into an interdisciplinary context appropriate for policy makers, water resource managers, and government agencies, as well as research scientists and

environmental groups; and (iii) providing a contemporary compilation of case studies, applications, and research findings from around the world.

As such, this book takes complementary perspectives in order to reach an understanding of the types and consequences of multiple stressors in river systems. One series of chapters details the impacts of multiple stressors in regard to some of the main driving stressors and their implications. A second series of chapters embraces the geographical perspective and describes the relevance of multiple stressors in different ecoregions of the world, their effects on the river ecosystems, and their implications for biodiversity, structure, function, and human uses and perceptions. The final series of chapters account for the ways multiple stressor challenges can be approached, including managerial and social perspectives. Most of the chapters in the book use examples and provide updated references, as well as make use of pictures and graphs to illustrate the specific stressors and their effects on river ecosystems.

Finally, by summarizing the main findings and exposed evidence, the book aims to explore implications and provides recommendations for research, management, and policy. The rising number of stressors affecting river ecosystems, their increasing geographic extent, and their important consequences for both nature and society make it essential to adapt current river monitoring schemes and create a data repository to account for the evidence existing from many different sources. The worldwide examples

reveal the necessity to consider scale dependencies in multiple stressor occurrences, as well as to undertake a more active scientific and social communication of risks associated thereto. All the evidence collected in the book, as well as the many uncertainties that can be envisaged, require prompt and concerted actions, not solely from the research side, but also from the societal side, where management and policy should be included. The challenges we face require moving to areas of the planet where many lessons can still be learned, and preserve as much as possible all other regions which have already suffered from long-lasting impairment.

We trust that the contents of this book, which has collected and combined the

fragmented knowledge on multiple stressors in river ecosystems, can serve as a synthetic reference for researchers in all aquatic and environmental sciences. Given the breadth and interdisciplinarity of the presented materials, the target audience also includes graduate students and professionals in riverine ecology, as well as river and catchment managers.

We hope that this elaboration on multiple stressors in river ecosystems will enhance readers' enthusiasm to delve more deeply into this fascinating and highly relevant field. Enjoy!

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