

Call for applications:

2 PhD fellowships (3 years) on River Conservation and Management at the University of Strasbourg

General information:

Under the auspices of the EUCOR Excellence Chair on Water and Sustainability, the UNESCO Chair on Rivers and Heritage, and the new Interdisciplinary Institute on Water and Urban Sustainability (Sustainabil-ITI), at the University of Strasbourg, and supported by the French National School for Water and Environment ENGEES (at Strasbourg, France), **two 3-year-PhD stipends are open for application**. Positions will be filled in October or November 2024 (the latest). Both PhD projects will work on the scientific bases for conservation and sustainable management of rivers, their floodplains and nearby terrestrial socio-ecosystems, however, **one thesis (A) will have a more regional approach on the Rhine Valley**, whereas **the other (B) will work on a global and conceptual approach**. Both candidates will be supervised by an interdisciplinary and international team of experts, within the frameworks of the EUCOR – the European Campus, the UNESCO water family and the professional networks by the supervising teams and involved stakeholders. Both theses are strongly application-oriented, with research aspects focussing on method development for managing rivers better, by increasing efficiency of measures/programmes, fostering harmony between different conservation/management systems and improving the transfer of positive examples from one site to another.

General background:

Rivers are the cradles of humanity and the most important life support system on the continents. However, worldwide, rivers are in crisis. Single-use approaches, siloed management and replacement of natural processes and dynamics by inadequate management have resulted in that riverine socio-ecosystems undergo multiple stressors and complex, often hardly manageable stress syndromes, which are currently reinforced by climate change. To mitigate this problem, it is necessary to develop holistic and feasible solutions, jointly with stakeholders, and monitor the outcome of implemented actions to learn for improving actions in the future. This requires inter- and transdisciplinary approaches, which use datasets and methods from various disciplines as a toolbox, while at the same time, there is the need to communicate management suggestions adequately with people from highly different societal and cultural backgrounds. The overall goal is to sustain nature's capacities to adapt and evolve, thus maintaining biological and cultural diversities and their effects on the liveability of this planet, as postulated by the River Culture Concept (Wantzen et al. 2016, 2023).

Further information:

- Applications should be submitted to the following email address veronique.marchant@unistra.fr, please indicate in the subject line if you are applying to **Thesis A (Rhine)** or **Thesis B (Global Concept)**
- Deadline for full application (Single pdf, indicating which of the two positions is targeted, letter of motivation no longer than 2 pages, CV with the qualifications for the position highlighted, and, if applicable, previously executed projects and publications: **1. September 2024**
- **Interviews** of pre-selected candidates will take place online **between 16. and 20. September 2024**

- Job begin at **1. November 2024**, the working site is University of Strasbourg
- We offer salary and social benefits according to French public sector regulations (30k€ gross per year)
- **Contact person** for further information (not for applications): Prof. Dr. Karl M. Wantzen, kmwantzen@unistra.fr

Thesis A: A combined conservation and habitat restoration concept for the Rhine

Thesis A (Rhine) – thematic background:

The Rhine has, like other European Rivers, undergone a phase of intensive industrialisation, pollution and rectification, but since the 1980s, its general water quality has been constantly improving (with exception of specific pollutants (Malaj et al., 2014)) and the general improvement of biodiversity, despite enormous efforts taken, has come to a halt in European countries (Haase et al., 2023). Conservation and restoration efforts have been undertaken for several decades, resulting in the local recovery and stabilisation of previously rare animal and plant populations and – to some degree – in the re-establishment of physical habitat dynamics (Beisel et al., 2021; Díaz-Redondo et al., 2018; Eschbach et al., 2018; Schmitt et al., 2019; Staentzel et al., 2018; Wantzen et al., 2023; Wantzen et al., 2021). However, the habitats of the Rhine, especially the Upper Rhine, remain strongly fragmented and degraded (BfN, 2009) and are prone to invasions by exotic species (Sexton et al., 2024). Moreover, the analyses of restoration success along the Rhine are locally biased, while despite a large number of projects, their outcome remains often unclear. Preliminary studies exist on the efficiency of nature reserves and conservation activities in non-dedicated sites on the French side of the Rhine (e.g., (Wurtz, 2018)), however, often the targets of the restoration projects were not well defined. Therefore, a systematic revision and an hypothesis-driven analysis of the success of restoration and conservation actions along the Rhine (with a focus on the Upper Rhine) is needed, in order to improve the existing programmes for the restoration and conservation of habitats, in the context of the new European restoration law, and the work by the International Commission for the Protection of the Rhine and its partners. The outcome of this study may serve as an orientation for restoration and conservation projects for other rivers worldwide and help to contribute case-wise evidence to an overarching sustainable management concept delivering a continuum of measures from restoration to conservation of rivers, cooperating with the second thesis on global river management.

Thesis A (Rhine) – expected activities:

The successful candidate should be able to (i) analyze the previous actions for conservation and sustainable management on the Rhine River, with a focus on the Upper Rhine (an extensive databank and unexploited reports exist and should undergo a systematic review and a statistical synthesis, followed by (ii) ecological field studies, including the selection of sites of interest both before and after restoration efforts, sites restored 10 years ago, or sites in proximity to protected or non-protected areas. These studies will involve species traits analyses of target species communities, environmental parameter recording, and studies on selected ecosystem functions. Next, (iii) interviews with actors and end-users will be conducted to gather qualitative data on perceptions and effectiveness of past projects. The outcomes of these different approaches and an analysis of the various regional, national, and international programs will be performed, supported by data from administrative partners. This will include a comparison of targets, drivers, and juridical-administrative frameworks to analyse the status quo. Based on these elements, and existing approaches on analysis for restoration/conservation measures, (iv) an evaluation method will be developed, and the most efficient approaches will be identified and integrated into a concept for the subbasin of the Upper Rhine, and, eventually, for the entire Rhine riverscape.

Overall, the ultimate goal is to develop a novel, eco-strategic approach for the Rhine to restore or reinforce natural ecosystem functions, including biotic aspects (species traits, communities and their functional performance, management of invasive species), physical connectivity of habitats (longitudinal, transversal and vertical), and environmental flows.

The work also includes the cooperation with diverse conservation and management institutions. The transboundary and transcultural aspects are very important in this context, as the overall target is to co-construct and communicate a border-crossing proposal, including a gradient from sustainable management to strict conservation, for the Upper Rhine and contribute to a more sustainable management strategy for the entire Rhine and other heavily modified rivers worldwide.

Thesis A (Rhine) – Candidates's profile:

Master thesis in environmental sciences. The outline of the thesis is transdisciplinary, however, candidates with a strong affinity for fieldwork are specifically encouraged to apply. Specifically, working experience with biological (field sampling, species identification, environmental parameter monitoring) and/or social data sampling (stakeholder interviews), processing and evaluation is required, with GIS (QGIS, ArcGIS), datamining techniques, statistics (R, Python) and data visualisation techniques being an asset. Due to the transboundary and transdisciplinary character of the work, candidates should be fluent in German and/or French and have a good command of the respective other language, so to communicate with public and private stakeholders. English proficiency is equally required for scientific communication. Ideal candidates have already a background on conservation and restoration projects, and know how to tackle the problems associated with the project cycle (stakeholder and legal background analysis, target definition, workplans, reporting, budget management) and the diverse conservation tools associated with rivers.

Working environment: The successful candidate will be employed and co-supervised by a team of experienced researchers from different UMRs (cooperative research centers) at University of Strasbourg, the French National School on Water and Environment ENGEES and the Aueninstitut by the Karlsruhe Institut für Technologie, and supported by the International Commission for the Protection of the Rhine and regional environmental authorities in the riparian countries of the Rhine.

Thesis B (Global River Conservation)

Thesis B (Global River Conservation) – thematical background:

The global river crisis has reached and gone beyond tipping points (Dudgeon, 2019; Harper et al., 2021; Reid et al., 2019; Vörösmarty et al., 2018), e.g. concerning the degree of fragmentation and flow patterns (Grill et al., 2019; Gudmundsson et al., 2021) or pollution (Brauns et al., 2022; van Emmerik et al., 2022). Designated sites (nature reserves etc.) are one option to improve conservation (Clamote Rodrigues & Schaaf, 2016; McInnes et al., 2017; Nel et al., 2007; Yousry et al., 2022), however, there is a lack of such sites dedicated to rivers and other inland water systems (lakes, wetlands, etc.), and they cover a too small surface, are fragmented, and/or impacted by the neighbouring areas (flow regulation, pollution, heat, water abstraction etc.). It is urgently needed to improve the global management and conservation concepts for rivers and to communicate them more efficiently to decision makers. There is a large bias between some countries of the Global North trying to improve the environmental quality of the last remaining vestiges of more or less preserved (or restored) river sections and those of the Global South, where the transformation of still-preserved, large river sections into canals, sewers and series of impoundments is running at full speed. Transboundary cooperation between riparian states exists to facilitate navigation or flood control but quite rarely to develop basin-wide conservation schemes that produce a positive impact on environmental quality, expressed as ecosystem functions, biological and cultural diversities and health. There is a plethora of suggestions for managing rivers better at a global scale, but the gap between ecological-conservationist approaches and exploitation-oriented, and geographically and/or asset-focused, siloed policies is still wide.

Thesis B (Global River Conservation) – expected activities:

The successful candidate should analyze the existing, global and selected regional/national schemes for the conservation of biological and/or cultural diversity in riverscapes (i.e., river-floodplain-systems and adjacent valley sections), which are highly diverse and only partially compatible with each other. Work should include a comparison of drivers, targets, measures, involved authorities and practical formats of these measures (e.g., designated sites such as nature reserves, biospheres,...). This, combined with a case-based performance analysis (answering the questions: to which degrees (and which ends) rivers are protected in the respective areas? What are the limitations, how can they be overcome?) will help to elaborate overarching strategies for river conservation, but also highlight areas (and river basins), in which the largest need for action exists, resulting in recommendations for socioecosystem-specific activities, including a biogeographical scaling. These strategies should combine sustainable human social and cultural practices with conservation approaches. As a general goal, it is envisaged to develop an overarching concept for the “management-conservation gradient”, i.e. to optimise the support for natural dynamics and ecosystem processes favorable to biodiversity and cultural diversity, and sustainable use of resources, and to combine them with strict conservation approaches for highly sensitive species and/or habitats. Moreover, a list of rivers should be developed (based on existing databases) that should receive global priority for conservation and restoration. This novel approach will be integrated into the build-up of international restoration/management/conservation concepts.

Thesis B (Global River Conservation) – Candidates’s profile:

Master thesis in environmental sciences in the widest sense. Candidates with a natural sciences or human sciences background are evenly encouraged to apply, however a profound knowledge of

sustainable management and conservation concepts is required. The ideal candidate has experience with national and/or international (including transboundary) conservation mechanisms and can deliver a synopsis of the existing approaches at different spatial and political scales, develop criteria for evaluating their targets and efficiency, and study options for harmonizing/combining different approaches. To do so, it is necessary to study very different types of data sources, work with databanks, conservation-related software and GIS, and build up a multi-criteria decision analysis, which can later be applied to individual river systems. As there are many institutions (academic, governmental and non-governmental) working on this globally relevant thematic, communication skills, team play and responsibility assignment are required. Candidates should participate in and organize meetings and workshops (mostly online) and communicate and visualise their results efficiently. Due to the transboundary and transdisciplinary character of the work, candidates should be able to communicate with public and private stakeholders, ideally in several languages. English proficiency is essential.

Working environment: The successful candidate will be employed via the University of Strasbourg, and be co-supervised by a team of experienced researchers from different UMRs (cooperative research centers) at University of Strasbourg, and supported by EUCOR – the European Campus and the UNESCO water families and their professional networks, in tight collaboration with UNESCO, IBPES and IUCN along with international NGOs such as WWF, and national and global socio-economic players.

Cited literature (for both theses proposals):

- Beisel, J.-N., Staentzel, C., Skupinski, G., Walch, A., Pons, M., Weber, S., Granier, C., & Huber, A. (2021). Evolution of relict floodplain forest in river stretches of Western and Central Europe as affected by river infrastructure networks. *PLoS one*, 16(9), e0257593. <https://doi.org/10.1371/journal.pone.0257593>
- BfN. (2009). *Auenzustandsbericht Flussauen in Deutschland*. <https://www.bfn.de/fileadmin/MDB/documents/themen/wasser/Auenzustandsbericht.pdf>
- Brauns, M., Allen, D. C., Boëchat, I. G., Cross, W. F., Ferreira, V., Graeber, D., Patrick, C. J., Peipoch, M., von Schiller, D., & Gücker, B. (2022). A global synthesis of human impacts on the multifunctionality of streams and rivers. *Global Change Biology*. <https://doi.org/https://doi.org/10.1111/gcb.16210>
- Clamote Rodrigues, D., & Schaaf, T. (2016). *Managing MIDAs Harmonising the management of Multi-Internationally Designated Areas: Ramsar Sites, World Heritage sites, Biosphere Reserves and UNESCO Global Geoparks*. <https://www.iucn.org/content/managing-midas-harmonising-management-multi-internationally-designated-areas>
- Díaz-Redondo, M., Egger, G., Marchamalo, M., Damm, C., de Oliveira, R. P., & Schmitt, L. (2018). Targeting lateral connectivity and morphodynamics in a large river-floodplain system: The upper Rhine River. *River Research and Applications*, 34(7), 734-744. <https://doi.org/https://doi.org/10.1002/rra.3287>
- Dudgeon, D. (2019). Multiple threats imperil freshwater biodiversity in the Anthropocene. *Current Biology*, 29(19), R960-R967. <https://doi.org/https://doi.org/10.1016/j.cub.2019.08.002>
- Eschbach, D., Schmitt, L., Imfeld, G., May, J.-H., Payraudeau, S., Preusser, F., Trauerstein, M., & Skupinski, G. (2018). Long-term temporal trajectories to enhance restoration efficiency and sustainability on large rivers: an interdisciplinary study. *Hydrology and Earth System Sciences*, 22(5), 2717-2737.
- Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., Babu, S., Borrelli, P., Cheng, L., Crochetiere, H., Ehalt Macedo, H., Filgueiras, R., Goichot, M., Higgins, J., Hogan, Z., Lip, B., McClain, M. E., Meng, J., Mulligan, M., . . . Zarfl, C. (2019). Mapping the world's free-flowing rivers. *Nature*, 569(7755), 215-221. <https://doi.org/10.1038/s41586-019-1111-9>
- Gudmundsson, L., Boulange, J., Do, H. X., Gosling, S. N., Grillakis, M. G., Koutroulis, A. G., Leonard, M., Liu, J., Müller Schmied, H., Papadimitriou, L., Pokhrel, Y., Seneviratne, S. I., Satoh, Y., Thiery, W., Westra, S., Zhang, X., & Zhao, F. (2021). Globally observed trends in mean and extreme river flow attributed to climate change. *Science*, 371(6534), 1159-1162. <https://doi.org/10.1126/science.aba3996>
- Haase, P., Bowler, D. E., Baker, N. J., Bonada, N., Domisch, S., Garcia Marquez, J. R., Heino, J., Hering, D., Jähnig, S. C., & Schmidt-Kloiber, A. (2023). The recovery of European freshwater biodiversity has come to a halt. *Nature*, 620(7974), 582-588.
- Harper, M., Mejbil, H. S., Longert, D., Abell, R., Beard, T. D., Bennett, J. R., Carlson, S. M., Darwall, W., Dell, A., Domisch, S., Dudgeon, D., Freyhof, J., Harrison, I., Hughes, K. A., Jähnig, S. C., Jeschke, J. M., Lansdown, R., Lintermans, M., Lynch, A. J., . . . Cooke, S. J. (2021). Twenty-five essential research questions to inform the protection and restoration of freshwater biodiversity. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 31(9), 2632-2653. <https://doi.org/https://doi.org/10.1002/aqc.3634>
- Malaj, E., von der Ohe, P. C., Grote, M., Kühne, R., Mondy, C. P., Usseglio-Polatera, P., Brack, W., & Schäfer, R. B. (2014). Organic chemicals jeopardize the health of freshwater ecosystems on the continental scale. *Proceedings of the National Academy of Sciences*. <https://doi.org/10.1073/pnas.1321082111>
- McInnes, R., Kenza Ali, M., & Pritchard, D. (2017). *Ramsar and World Heritage Conventions: Converging towards success* (Subtitle: How cultural values and community participation contribute to positive conservation outcomes for internationally designated wetlands, Issue.

https://www.ramsar.org/sites/default/files/documents/library/ramsar_whc_converging_towards_success_e.pdf

- Nel, J. L., Roux, D. L., Maree, G., Kleynhans, C. J., Moolman, J., Reyers, B., Rouget, M., & Cowling, R. M. (2007). Rivers in peril inside and outside protected areas: a systematic approach to conservation assessment of river ecosystems. *Diversity and Distributions*, 13(3), 341-352. <https://doi.org/10.1111/j.1472-4642.2007.00308.x> (ON REQUEST (04/18/07))
- Reid, A. J., Carlson, A. K., Creed, I. F., Eliason, E. J., Gell, P. A., Johnson, P. T. J., Kidd, K. A., MacCormack, T. J., Olden, J. D., Ormerod, S. J., Smol, J. P., Taylor, W. W., Tockner, K., Vermaire, J. C., Dudgeon, D., & Cooke, S. J. (2019). Emerging threats and persistent conservation challenges for freshwater biodiversity. *Biological Reviews*, 94(3), 849-873. <https://doi.org/https://doi.org/10.1111/brv.12480>
- Schmitt, L., Beisel, J., Preusser, F., De Jong, C., Wantzen, K., Chardon, V., Staentzel, C., Eschbach, D., Damm, C., & Rixhon, G. (2019). Sustainable Management of the Upper Rhine River and its Alluvial Plain: Lessons from Interdisciplinary Research in France and Germany. 153–174. *Sustainable Research in the Upper Rhine Region. Concepts and Case Studies*. Strasbourg, 201-226. <https://doi.org/hal-02428921>
- Sexton, A. N., Beisel, J.-N., Staentzel, C., Wolter, C., Tales, E., Belliard, J., Buijse, A. D., Martínez Fernández, V., Wantzen, K. M., & Jähnig, S. C. (2024). Inland navigation and land use interact to impact European freshwater biodiversity. *Nature Ecology & Evolution*, 1-11.
- Staentzel, C., Arnaud, F., Combroux, I., Schmitt, L., Trémolières, M., Grac, C., Piégay, H., Barillier, A., Chardon, V., & Beisel, J. N. (2018). How do instream flow increase and gravel augmentation impact biological communities in large rivers: A case study on the Upper Rhine River. *River Research and Applications*, 34(2), 153-164. <https://doi.org/10.1002/rra.3237>
- van Emmerik, T., Mellink, Y., Hauk, R., Waldschläger, K., & Schreyers, L. (2022). Rivers as plastic reservoirs. *Frontiers in Water*, 3, 212. <https://doi.org/https://doi.org/10.3389/frwa.2021.786936>
- Vörösmarty, C. J., Rodríguez Osuna, V., Cak, A. D., Bhaduri, A., Bunn, S. E., Corsi, F., Gastelumendi, J., Green, P., Harrison, I., Lawford, R., Marcotullio, P. J., McClain, M., McDonald, R., McIntyre, P., Palmer, M., Robarts, R. D., Szöllösi-Nagy, A., Tessler, Z., & Uhlenbrook, S. (2018). Ecosystem-based water security and the Sustainable Development Goals (SDGs). *Ecohydrology & Hydrobiology*, 18(4), 317-333. <https://doi.org/https://doi.org/10.1016/j.ecohyd.2018.07.004>
- Wantzen, K. M., Schmitt, L., & Wirbelauer, B. (2023). The Rhine – an important biocultural axis for Europe. . In K. M. Wantzen (Ed.), *River Culture - Life as a dance to the rhythm of the waters*. UNESCO.
- Wantzen, K. M., Uehlinger, U., Van der Velde, G., Leuven, R. S. E. W., Schmitt, L., & Beisel, J. N. (2021). The Rhine River Basin. In K. Tockner & C. T. Robinson (Eds.), *Rivers of Europe, 2nd Edition* (pp. 333-391). Elsevier. <https://doi.org/https://doi.org/10.1016/B978-0-08-102612-0.00006-7>
- Wurtz, M. (2018). *Diagnostic de la restauration des Réserves Naturelles Nationales du Rhin supérieur : Etude rétrospective et prospective* Strasbourg].
- Yousry, L., Cao, Y., Marmiroli, B., Guerri, O., Delaunay, G., Riquet, O., & Wantzen, K. M. (2022). A Socio-Ecological Approach to Conserve and Manage Riverscapes in Designated Areas: Cases of the Loire River Valley and Dordogne Basin, France. *Sustainability*, 14(24), 16677. <https://doi.org/https://doi.org/10.3390/su142416677>