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Wetlands as large-scale nature-based solutions: status and future challenges for research and management

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Wetlands are often considered as nature-based solutions that can provide a multitude of services of great social, economic and environmental value to humankind. The services may include recreation, greenhouse gas sequestration, contaminant retention, coastal protection, groundwater level and soil moisture regulation, flood regulation and biodiversity support. Changes in land-use, water use and climate can all impact wetland functions and occur at scales extending well beyond the local scale of an individual wetland. However, in practical applications, management decisions usually regard and focus on individual wetland sites and local conditions. To understand the potential usefulness and services of wetlands as larger-scale nature-based solutions, e.g. for mitigating negative impacts from large-scale change pressures, one needs to understand the combined function multiple wetlands at the relevant large scales. We here systematically investigate if and to what extent research so far has addressed the large-scale dynamics of landscape systems with multiple wetlands, which are likely to be relevant for understanding impacts of regional to global change. Our investigation regards key changes and impacts of relevance for nature-based solutions, such as large-scale nutrient and pollution retention, flow regulation and coastal protection. Although such large-scale knowledge is still limited, evidence suggests that the aggregated functions and effects of multiple wetlands in the landscape can differ considerably from those observed at individual wetlands. Such scale differences may have important implications for wetland function-effect predictability and management under large-scale change pressures and impacts, such as those of climate change.