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Spatial prediction of potential wetlands at the French national scale based on hydroecoregions stratification and inference modelling.

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The prediction of wetlands at the national scale is crucial to design and implement consistent national policies aiming at preserving these fragile but essential ecosystems involved in the production of many fundamental ecosystem services. Depending on the topographic situation, the occurrence of potential wetlands is mostly driven by geomorphology and rainfall and the vertical distance to the channel network. This study aims to test for France the nationwide implementation of a method based on a topo-climatic index in combination with the vertical distance to the channel network to predict the spatial distribution of potential wetlands.

Following the PEEW approach used in this study (based on potential, existing, and efficient wetland functional assessment), potential wetlands include all geographical situations where geomorphological and/or climatic criteria may entail high probability of wetland occurence. Potential wetlands include therefore former wetlands areas destructed for instance by artificial drainage, urbanization or river straightening. Topo-climatic index and the vertical distance to the channel network were calculated nationwide. To determine the threshold of these indices, France was stratified into hydroecoregions, based on geology, climate, topography, vegetation and channel network density. Within each hydroecoregion, cumulative frequencies of the topo-climatic index were calculated and a threshold was determined according to pedological data (percentage of hydromorphic soils) available in the area and using a probabilistic approach, whereas the threshold of the vertical distance to the channel network was computed alongside the potential flood zone. Both were combined according to a decision tree based on permeability of the soil surface and topographic situations in order to get a national prediction of the location of potential wetlands. Results were validated against point-specific soil data and detailed soil maps.

Combination of climato-topographic index and the vertical distance to the channel network was better at predicting the nationwide spatial distribution of wetlands with a highly improved accuracy by comparison with monofactorial modelling. The first validation test using point-specific soil data were satisfactory, the overall accuracy of validation equaled 67.8%, the accuracy for potential wetlands equaled 54.6% and the Kappa index amounted to 0.17. The accuracy seems to be poor for areas where few soil data were available to determine the threshold, thus stressing the need for further acquisition of soil data. The potential of this strategy to predict wetlands over large areas was therefore confirmed.