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TREHS (Temporary Rivers Ecological and Hydrological Status): new software for investigating the degree of hydrologic alteration of temporary streams.

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The evaluation of the hydrological alteration of a stream due to human activities is a first step to assess its overall quality and to design management strategies for its potential restoration. This task is currently made comparing impacted against unimpacted hydrographs, with the help of software tools, such as the IHA (Indicators of Hydrologic Alteration). Then, the environmental evaluation of the hydrological alteration is to be made in terms of its expectable menace for the original biological communities and/or its help for the spread of invasive species. However, when the regime of the target stream is not perennial, there are four main difficulties for implementing methods for assessing hydrological alteration: i) the main hydrological features relevant for biological communities in a temporary stream are not quantitative (discharges) but qualitative (temporal patterns of states such as flowing water, stagnant pools or lack of surface water), ii) stream flow records do not inform on the temporal occurrence of stagnant pools, which act as refugees for many species during the cessation of flow, iii) as most of the temporary streams are ungauged, the evaluation of their regime must be determined by using alternative methods such as remote sensing or citizen science, and iv) the biological quality assessment of the ecological status of a temporary stream must be conducted following a sampling schedule adapted to the flow regime and using adequate reference conditions.

In order to overcome these challenges using an operational approach, the TREHS freely available software tool has been developed within the EU LIFE TRIVERS project (LIFE13 ENV/ES/000341). This software allows for the input of information coming from flow simulations obtained using any rainfall-runoff model (to set an unimpacted reference stream regime) and compares them with the information obtained from flow gauging records, interviews made to local citizens, instantaneous observations made by individuals, and by interpretation of aerial photographs. Up to six metrics defining the permanence of water flow, the presence of stagnant pools and their temporal patterns of occurrence are used to determine the natural and observed river regime, and to assess the degree of hydrological alteration. Here, given the lack of agreed standards to evaluate the ecological relevance of the observed alterations, the thresholds that define quality class boundaries are provisional and may be updated using expert knowledge. Finally, the software characterizes the differences between the natural and actual regimes, performs a diagnosis of the hydrological status (degree of hydrologic alteration) along with an assessment of the significance and robustness of the diagnosis, and recommends the best period for biological quality samplings.