

Despite being properly treated and highly diluted, wastewater still impacts river ecosystem, finds study

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Members of UPV/EHU's Stream Ecology group. Credit: University of the Basque Country

An experiment using water from a large wastewater treatment plant

(WWTP) carried out by the Stream Ecology group has shown that this water continues to affect river diversity and the trophic web (food web) despite being properly treated and highly diluted before discharge. The study, published in the [*Journal of Environmental Management*](#), shows that the limits currently in place and the procedures used to treat wastewater may not be sufficient to protect the natural properties of food webs

Wastewater treatment plants have considerably improved [water quality](#) around the world since the quantity of pollutants reaching [aquatic ecosystems](#) has been significantly reduced as a result of environmental regulatory procedures. However, despite the fact that the effluent discharged through [wastewater treatment plants](#) is treated, what is left behind is a complex cocktail of pollutants, nutrients and pathogens, whose [environmental effects](#), hidden by other factors, may pass unnoticed.

More advanced WWTPs apply additional treatments to reduce nutrients, organic matter and metals in the sewage, and these wastewater discharges, despite being highly diluted, can exert minor effects if they continue for a long time.

"To study the effects of these plants properly, we designed an innovative experiment that allowed us to handle the entire ecosystem over several years," explained Ioar de Guzmán, a researcher in the UPV/EHU's Stream Ecology group. First, several variables were measured for one year in two selected reaches in an unpolluted stream, to see the difference between these reaches. "That way we knew how these stream variables changed depending on time and place," she said.

After that, properly treated, highly diluted [water](#) from a WWTP was diverted to one of these downstream reaches, and the team "took measurements over the period of another year in both reaches to see

what changes had been brought about by these discharges on the diversity of the stream and on the trophic network (group of organisms organized by food relationships) and on the functioning of the ecosystem."

Significant changes in the ecosystem

The study showed that treated wastewater can exert significant effects on the ecosystem and affect the structure and functioning of stream communities even if it is highly diluted when discharged. Although the toxicity of the effluent was found to be low, "in general, invertebrate diversity was reduced and communities became more heterogeneous; the amount of algae and herbivory (or tendency to feed on plants) increased," explained the researcher.

Although the wastewater is treated, certain nutrients that can help boost algae and [organic matter](#) enter the stream, but the pollutants can also lead to the disappearance of sensitive invertebrates and their replacement by more resistant ones.

It is therefore clear that the more advanced processes currently used in [wastewater](#) treatment continue to affect freshwater ecosystems, and that the conservation of freshwater food webs requires intensified efforts in the treatment of polluted waters.

"We believe that by adhering to the limits stipulated by the legislation, the problems are reduced, but impacts are nevertheless generated; we must bear in mind that for an optimal conservation of the trophic networks of the streams, these treatments have to be even more stringent," concluded the researcher from the Stream Ecology group.

More information: Ioar de Guzman et al, Treated and highly diluted, but wastewater still impacts diversity and energy fluxes of freshwater

food webs, *Journal of Environmental Management* (2023). [DOI: 10.1016/j.jenvman.2023.118510](https://doi.org/10.1016/j.jenvman.2023.118510)

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