Does sampling frequency matter? Comparative analysis of physicochemical quality elements in the Manzanares River (Madrid, Spain)

Francisco M. CORTÉS SÁNCHEZ[1], María DÍAZ-REDONDO[1], Manuel GARCÍA[1]

[1] Centre for Studies and Experimentation on Public Works (CEDEX). Alfonso XII, 3, 28014 Madrid, Spain.
email: Francisco.M.Cortes@cedex.es (for author 1)

email: maria.diaz@cedex.es (for author 2)

email: manuel.colomer@cedex.es (for author 3)

ABSTRACT

The environmental monitoring of water quality is widely adopted in the European Union upon the entry into force of the Water Framework Directive (WFD). However, the sampling frequency of the monitoring programmes have barely change in some Member States since then, more than 20 years ago. In the Manzanares River, where there exist several sampling points from public institutions and where the project "Recovery of the fluvial ecosystem Manzanares-Gavia-Bulera. Green and blue infrastructure Metropolitan Forest of Madrid" is being developed, an opportunity has arisen to study the sampling frequency on physicochemical quality element indicators. From the analysis of the available data, the aim is to determine whether the sampling frequency could affect the assessment of the physicochemical status, and hence influence the classification of the ecological status. To do this, data will be used from the Tagus River Basin Authority and from the Madrid City Council.

1. Introduction

The Water Framework Directive (WFD) 2000/60/EC obliges Member States to develop different monitoring programmes (surveillance, operational and investigative) to monitor and assess the ecological status of water bodies. It also sets the minimum frequency of monitoring for the surveillance and operational programmes, defining a frequency of three months for sampling parameters indicative of physicochemical quality elements under the surveillance programme, and suggesting the same guideline for the operational programmes, which should be determined ultimately by Member States. In Spain, the Royal Decree 817/2015, of September 11, which establishes the criteria for monitoring and evaluating the state of surface waters and environmental quality standards regulates the design and implementation of the monitoring programmes for the assessment of the ecological status of water bodies, which includes the frequency of monitoring. In this regard, it establishes that physicochemical quality elements and specific contaminants will be controlled at least every three months, although monthly control is recommended.

In the Manzanares River, the project "Recovery of the fluvial ecosystem Manzanares-Gavia-Bulera. Green and blue infrastructure Metropolitan Forest of Madrid" for recovering the riverine vegetation corridor through the removal of the current concrete outlets and their setting backwards, further from the riverbank, is being carried out. Given that this is a work in the vicinity of the river, with possible impact on the river ecosystem, it is mandatory to carry out environmental monitoring that includes, among other indicators, physicochemical parameters of water quality. Sampling points from the Tagus River Basin Authority (TRBA) and the Madrid City Council will be analysed to evaluate whether the sampling frequency could influence the results obtained in the determination of the status given by the physicochemical quality elements.

2. Methods

The study site comprises the section of the Manzanares River downstream the dam number 10 until the municipal boundary of Madrid, La Gavia stream and La Bulera stream, being the Manzanares River part of the "Río Manzanares a su paso por Madrid (ES030MSPF0427021)" water body (Fig. 1).

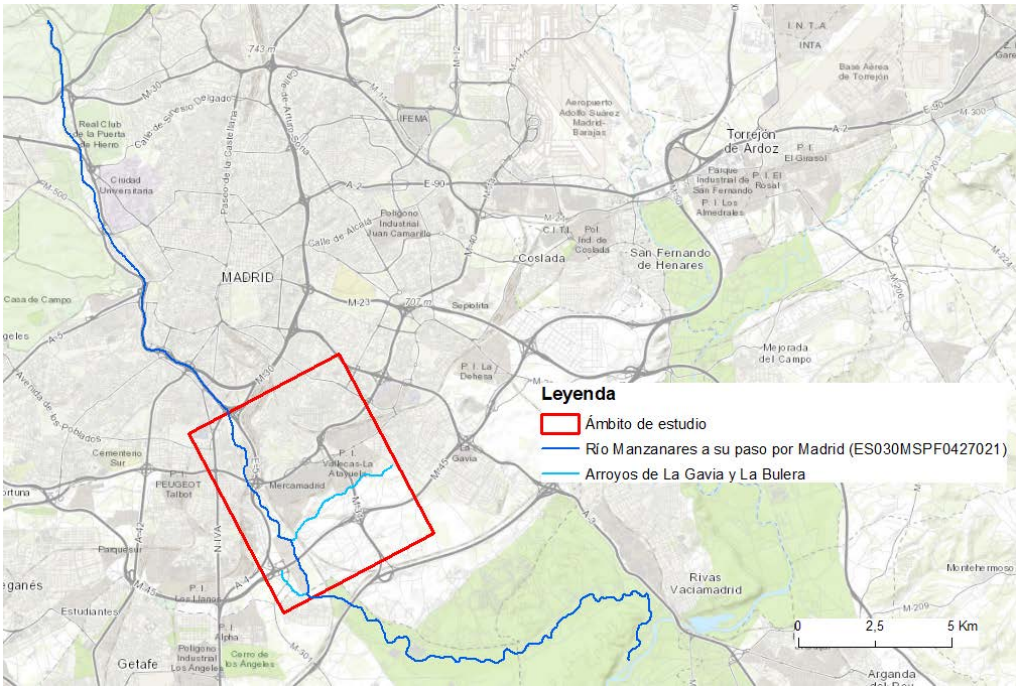

Fig. 1. Location of the study site within the "Río Manzanares a su paso por Madrid (ES030MSPF0427021)" water body.

Within the study area there exist two physicochemical sampling points from the TRBA and four sampling points from the Madrid City Council. Nonetheless, only two of them, coincident with the TRBA sampling points, will be used (Table 1). To determine whether the sampling frequency could affect the assessment of the physicochemical status, the assessment will be focused on the physicochemical quality elements and it will be carried out from a period of the last six years (period 2017 – 2023). According to the criteria established by the Spanish Ministry of Ecological Transition and Demographic Challenge (MITERD, 2021), the assessment unit is the hydrological year, so the evaluation will be made both individually and then in an aggregate way for the six-year period. The value per assessment unit and variable will be obtained using the medians of the annual observations. For the aggregate evaluation (multi-year) the median of the medians will be used.

Table 1. Information of the physicochemical control points in the "Río Manzanares a su paso por Madrid (ES030MSPF0427021)" water body for the years analysed (2017-2023).

Sampling point	Name	Institution	**UTMX**	**UTMY**
TA55905002	SAN FERMÍN - MANZANARES	TRBA	441496	4470243
TA55905003	VILLAVERDE - MANZANARES	TRBA	442123	4467982
9,3		Madrid Council	441506	4470193
ABCH		Madrid Council	442396	4467695

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