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Review

Application of indicators of hydrologic alterations in the designation of heavily modified water bodies in Spain

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ARTICLE INFO

Keywords:

Heavily modified water bodies
Indicator of hydrologic alteration
Irrigation reservoir
European Water Framework Directive

ABSTRACT

In Europe, the Water Framework Directive (2000/60/EC) demands the achievement of a good ecological status for water bodies by 2015. However, it also defines exceptions to these objectives, such as a good ecological potential instead of a good ecological status or a more distant temporal horizon than 2015. Those exceptions may only be applied to heavily modified water bodies (HMWBs). This paper presents a method, P-IAHRIS, incorporated into the free software IAHRIS v2.2, that offers objective criteria for the preliminary designation of HMWBs downstream from irrigation dams, flood protection dams or drinking water supply dams. The procedure incorporates two indicators: (i) the P10%–90% indicator, which analyses the alterations in the flow regime associated with the range of natural variability defined by the 10th and 90th percentiles of the annual and monthly discharges; and (ii) the IHA-HMWB indicator, which assesses the changes in the magnitude, seasonality, variability and duration of natural flows. P-IAHRIS was applied to 103 water bodies in Spain. The functionality and versatility of the method have been proven and allow the fast and objective preliminary designation of HMWBs, both in the Mediterranean and Atlantic environments.

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1. Introduction

The Water Framework Directive (WFD) (European Commission, 2000) is an essential milestone of European environmental legislation that places river ecology as the focus of water resource management. A decade after its publication, great advances have been achieved, but many changes are still necessary to fulfil its ambitious objectives and deadlines (Hering et al., 2010).

The WFD allows the identification and designation of water bodies for which good ecological status is not compulsory.

They are known as “artificial water bodies (AWBs)” and “heavily modified water bodies (HMWBs)”. The latter have been substantially changed as a result of physical alterations, which are changes in the hydrological or morphological attributes of the water body associated with human activities. A substantial change is an extensive, intense or evident shift in the hydrological and morphological characteristics of the water body relative to a reference condition. Thus, substantial hydrological and morphological changes are necessary for the designation of an HMWB. For this designation, the following items must be justified: (i) the changes required to achieve good ecological status (GES) enhance core negative effects on

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doi:10.1016/j.envsci.2011.10.004