



## **Using air photographs to detect geomorphological and riparian vegetation changes in a streamflow regulated river. The case of Guadarrama river (Central Spain)**

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Water Framework Directive implementation is a target for European member states implying a strong effort of analysis, prioritization and restoration. Restoration must recover mainly ecological processes rather than simply appearance, beauty or recreational values. The first step towards restoration is to recognize and characterize river features under natural conditions or potential conditions in case of artificial water bodies. In this sense, the use historical records of aerial photographs, in combination with other ancillary data, could be really helpful.

The aim of this study is to investigate the effects of streamflow regulation on the geomorphology and on the riparian vegetation structure of the Guadarrama river in Central Spain. For the latter, three different study areas were selected based on a previous hierarchical classification that was performed according to the González del Tánago – García de Jalón (2004) method, and based on the existence of dams.

Used materials involved historical records of aerial photographs (1956, 1972, 1991 and 2006) that were orthorectified. Mentioned years cover both natural and regulated conditions. Ancillary data included: topographic maps (planimetry and altimetry), climate and meteorological information, geology maps, vegetation maps, field surveys, flow regimens, etc.

Changes detected in aerial photographs were recorded using GIS tools. On the one hand, changes in geomorphology were measured in terms of channel length, fluvial and riparian spaces, sinuosity index, etc. On the other hand, changes in riparian vegetation were measured in terms of spatial patterns of vegetation patches (persistence, evolution, etc.) and composition (sediment, grass, shrubs, forest).

The major goal of this study is that it allows us to determine the natural driving forces in riparian ecosystems, as well as the degree of human-induced alteration. This is a key knowledge in order to design proper restoration programs, “basin-integrated”, to improve the ecological status of fluvial reaches and riparian ecosystems.