

Title:

Hydrodynamic changes in Guadalquivir Estuary (Spain) due to a hypothetical tidal marsh restoration project.

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Abstract:

Tidal marsh restoration will be an important management issue in Guadalquivir Estuary in the near future. The Guadalquivir Estuary has been anthropologically modified several times, the river is bounded by embankments to protect rice and cotton plantations from tidal inundation, the meanders have been transformed into straight sections, about 80 % of the original marsh surface has been lost and approximately one-fourth of the total surface of the estuary is now part of two protected areas, one of them is a UNESCO, MAB Biosphere Reserve.

A hypothetical restoration of tidal marshes will benefit different species and functions based on location, elevation, adjacent habitats, degree of hydrodynamic connectivity and would reduce the present high levels of turbidity. The restoration projects should be accompanied by studies for a better understanding of the environmental changes expected.

A Large-scale construction of tidal marsh will change tidal dynamics, modify the tidal inundation regime and the freshwater flow over the surrounding areas. A hydrodynamic model has been developed to study changes in the tidal propagation and the flow regime due to a hypothetical marsh restoration.

The model has been calibrated and the output has been validated with *in situ* water elevation and good agreement between modelled and real measurements have been obtained. A sensitivity test changing the size, locations from the estuary mouth and depth has been carried out to highlight impacts over the tidal propagation, flow regime, salinity intrusion and the tidal inundation regime.

Our preliminary results show that the tidal elevation and the current speed will be considerably affected in the estuary. The model opens the possibility to study interactions among the tidal marsh restoration project, Seville port operations, fisheries and agricultural activities. The numerical model will be a powerful tool in restoration projects in a complex socio-ecological system.