

## Ecological restoration in estuaries: overview of the published literature and main lessons

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Estuaries are both naturally complex and human-impacted environments where restoration activities and ecological knowledge acquisition are challenging. Ecological restoration initiatives in estuaries may suffer from a global lack of information and/or knowledge going from the objectives-setting step to the whole evaluation of the restoration project. Despite a growing number of published feedbacks, it still remains difficult to establish a clear link between measured effects and restoration efforts.

Moreover, lessons learned from former feedbacks may be not easily transferable to build a global reflexion given the strong heterogeneity in projects. Ideally, ecological restoration actions seek to re-establish damaged or lost ecological functions by acting on habitat structure and underlying processes but little is known concerning the required conditions to achieve good ecological functioning, i.e concerning the correct development of underlying physical, chemical, biological and ecological processes. In this context, an analysis based on 200 scientific papers was conducted to provide a first and non-exhaustive state of art to rely on in future restoration projects. This analysis sought to identify in the literature the main restoration objectives and estuarine habitats associated, the different approaches used in setting restoration objectives, the restoration techniques employed, and the methodology developed to assess the achievement of restoration objectives.

This analysis enabled to identify the different amount of knowledge detected and associated to the steps described above. It also pointed out the existence of predictive tools that could be used in future projects, and some key elements that must be assessed to clarify the links between habitat restoration and recovery of damaged or lost functions targeted by restoration actions.