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Effective saltmarsh restoration must account for previous land use

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Saltmarsh restoration can contribute to a range of ecosystem services but, according to new research, the effectiveness depends on previous land use. To optimise restoration, more research is needed on the effects of previous land disturbance on the delivery of ecosystem services and the relationships between physical, biogeochemical and ecological processes.

Coastal saltmarshes supply a variety of ecosystem services (ESs). The most important are providing sea defence, capturing pollutants and improving water quality, carbon storage and supplying habitats for fish and birds. Nearly half of all saltmarshes around the world have suffered degradation by humans and many restoration schemes in Europe and the USA have applied Managed Realignment (MR). This involves removing artificial flood defences, such as floodwalls or embankments, to allow the tide to move into low-lying coastal areas and restore or re-create saltmarshes.

However, there has been little research quantifying the ESs delivered by restored saltmarshes and how these might be affected by the former land use (e.g. agriculture or urbanisation). There is also a lack of understanding of the relationships between the physical, chemical and ecological processes within restored saltmarshes.

The study reviewed current data on saltmarsh restoration projects that involved the management (breaching, removal or lowering) of floodwalls, dykes or embankments to allow tidal flooding of previously protected land. Long-term data are rare since techniques such as MR are relatively recent and there is a tendency for projects to focus on ecological factors, such as birds and vegetation, rather than physical and biogeochemical characteristics.

The study indicated that restored saltmarshes may have significantly different qualities compared to naturally undisturbed sites. In restored sites there may be changes to sediment structure and the surface, which may influence drainage and water flow as well as the chemical and biological characteristics of the site. Sediments may have been drained, compacted or contaminated by agriculture and urbanisation and there may be a low level of organic matter owing to sediment drying.

It has been suggested that restored saltmarshes have poorer than expected vegetation development owing to poor drainage and lack of oxygen in the root zone. In addition, changes to sediment structure may impede the movement of tidal waters through the sediment. This could potentially disrupt the cycling of nutrients, carbon and pollutants, negatively affect the water quality and cause the release of greenhouse gases (GHGs), such as carbon dioxide, methane and nitrous oxides.

The study suggests restoration methods need to shift to a more holistic approach which provide the optimal delivery of ESs by taking an integrated view of the impact of previous land use on relevant physical, biological and chemical processes. Further research should attempt to develop an improved interdisciplinary understanding of saltmarsh restoration. For example, there is limited understanding of the relationship between sediment supply and tidal flow speeds, and the delivery and retention of seeds, or between sub-surface hydrology (directions and rates of water flow through the sediment) and the cycling of nutrients, pollutants and GHGs. A greater understanding of these and their contribution to ESs will inform the management of saltmarsh restoration and help provide more effective results.