

Optimizing ecosystem functions of estuarine restoration: reinstituting resilience at the landscape scale

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Although rehabilitating estuarine structure at the patch scale can enhance local ecosystem functions, it is important to acknowledge that the common ecoengineering approach is piecemeal and often not much more than “feel good” ecological gardening. An increasingly common argument for large-scale restoration planning is sustaining or recovering system resilience, which in the ecological resilience context is contingent on ecosystem variability.

Given the connectivity and diverse forcing affecting the functions of estuarine ecosystems, their restoration mandates at least understanding, if not planning for, variability in ecosystem processes and structure at a landscape context. While landscape considerations can be revealed by landscape structure, only by understanding ecosystem processes at landscape scales can restoration promote resilience in recovery.

Prerequisite conditions in a landscape approach to restoration would include: (1) extensive if not total removal of stressors inhibiting natural ecosystem dynamics; (2) re-establishment of both ecosystem structure and process landscape connectivity; (3) understanding hydrogeomorphic and other allometric controls on variability in estuarine ecosystem structure; (4) sufficient capacity to accommodate dynamic restoration responses; (5) setting priorities for restoration of mosaics, beyond patches; and, (6) planning to embrace natural scales of disturbance. The ultimate outcome of landscape restoration is sustainability in the knowledge and acknowledgement of natural variability and future change. Several examples from the Pacific Northwest USA of planning and implementing restoration at landscape scales are provided to illustrate the principles and consequences of process-based restoration that promotes resilience.