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# A decision tree to inform restoration of Salicaceae riparian forests in the Northern Hemisphere

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## Résumé

The regeneration of riparian shrub and tree species in the *Salicaceae* family is frequently impaired by human activities. *Salicaceae* forest restoration has been traditionally approached from a terrestrial perspective that emphasized planting. More recently, floodplain restoration activities have embraced an aquatic perspective, inspired by the emerging philosophy of environmental flows for river management. However, riparian *Salicaceae* species occur at the interface of both terrestrial and aquatic ecosystems along watercourses, and their regeneration depends on a complex interaction of hydrologic and geomorphic processes that have shaped key life-cycle requirements for seedling establishment. Ultimately, restoration needs to integrate these concepts to succeed. However, the literature reporting restoration actions on *Salicaceae* regeneration is scattered, and a specific theoretical framework is still missing. We reviewed 105 published experiences in restoration of *Salicaceae* forests, including 91 projects in 10 world regions throughout their range across the Northern Hemisphere, to construct a decision tree to inform restoration planning through explicit links between the well-studied biophysical requirements of *Salicaceae* regeneration and 17 specific restoration actions. Planting (in 55% of the projects), land contouring (30%), competing vegetation removal (30%), site selection (26%), and irrigation (24%) were the most common restoration actions. Environmental flows, including induced large pulse flows (8%), managed recessions (13%), base flows (7%) and flow sequencing (11%) were effective restoration actions in less populated areas. With alternative, innovative and feasible approaches that also incorporate human needs, it could be possible to restore *Salicaceae* riparian forests to better fit their new hydrologic and fluvial geomorphic situation.

**Mots-Clés:** Cottonwood, Decision tree, Environmental flow, Poplar, Riparian forest, Willow

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