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

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Background

- **Human activities** in floodplains have severely disrupted the **regeneration** of foundation riparian shrub and tree species of the ***Salicaceae* family** (*Populus* and *Salix* spp.) throughout the Northern Hemisphere.
- Restoration ecologists initially tackled this problem from a **terrestrial perspective** that emphasized planting. More recently, floodplain restoration activities have embraced an **aquatic perspective**, inspired by the expanding practice of managing river flows to improve river health (environmental flows).
- However, riparian *Salicaceae* occupy floodplain and riparian areas, which lie at the **interface** of both terrestrial and aquatic ecosystems along watercourses. Thus, 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, while regeneration of *Salicaceae* is now reasonably well-understood, the literature reporting **restoration actions** on *Salicaceae* regeneration is sparse, and a specific **theoretical framework** is still missing.

Goal

Create a tool to **inform restoration planning** through explicit links between the well-studied **biophysical requirements** of *Salicaceae* regeneration and specific **restoration actions**.

Methods

We reviewed 105 peer-reviewed published experiences in restoration of *Salicaceae* forests, including 91 projects in 10 world regions.

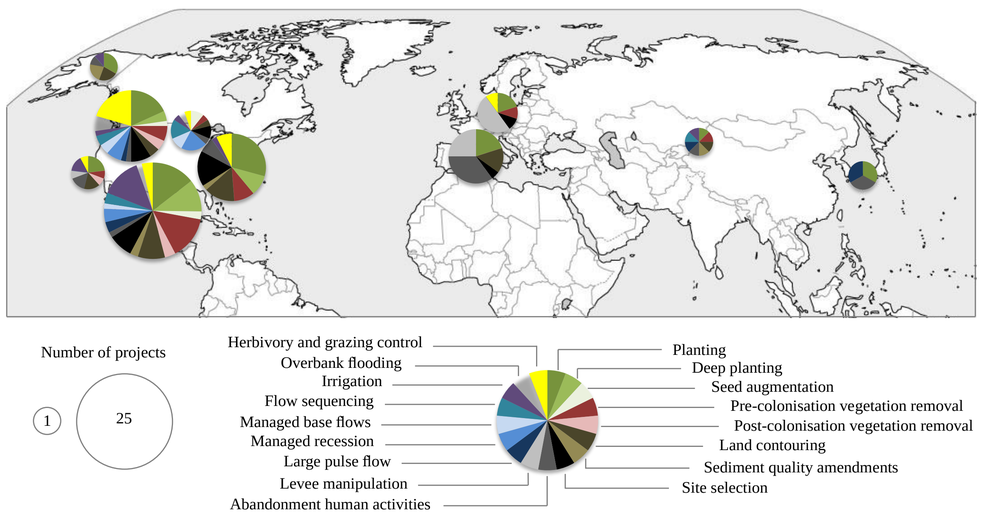

Figure 1. Relative importance of restoration actions by regions of the Northern Hemisphere. Size of pie charts and of the pie "slices" is proportional to the number of projects. North America was divided in the following eco-regions: Alaska (3 projects), Eastern Temperate Forests (14), Great Plains (5), Mediterranean California (4), Northwestern Forested (16), and Southwestern U.S. (27). Europe was divided in Central (7) and Southern (10). Asia was divided in Central (2) and Coastal (3). Note that different shades of the same color were used for related restoration actions (e.g., actions related to water management are depicted in different intensities of the blue color).

González E, Martínez-Fernández V, Shafroth PB, Sher AA, Henry AL, Garófano-Gómez V, Corenblit D (2018). **Regeneration of *Salicaceae* riparian forests in the Northern Hemisphere: A new framework and management tool**. *Journal of Environmental Management* 218: 374-387.

A decision tree for regeneration of *Salicaceae* forests

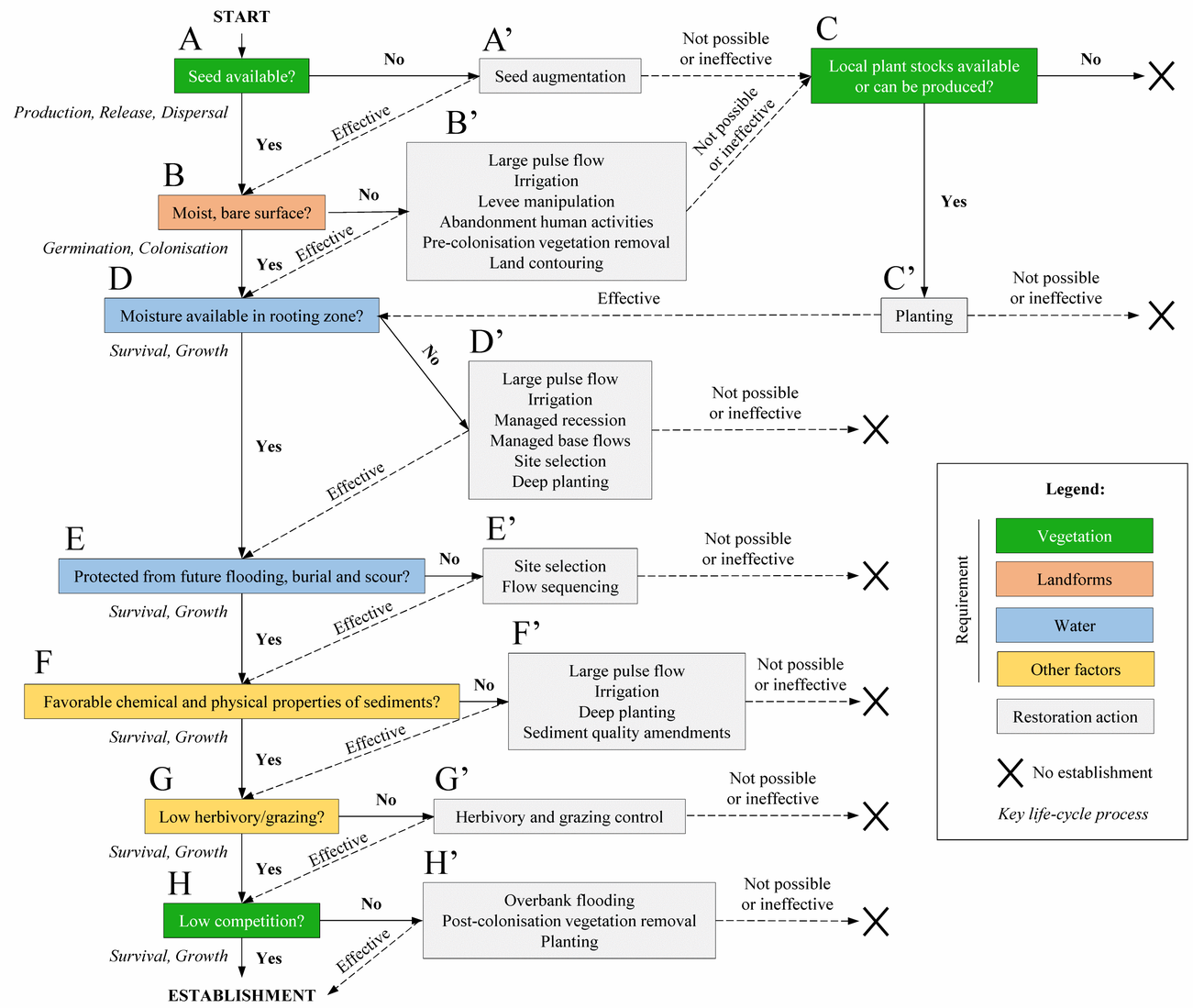

Figure 2. A stepwise dichotomous decision tree for restoring the regeneration capacity of *Salicaceae* forests. Boxes in the tree represent establishment requirements of seedlings and planted individuals. They are formulated as Yes/No questions, and are presented sequentially, following a chronological order related to the life-cycle of the plants associated with characteristics of vegetation, landforms, water and other factors. If a requirement is met ("Yes"), then the key life-cycle processes (in italics) occur and the next requirement is examined (downward facing arrows). "No" answers in the tree lead to white boxes that list restoration actions that would help meet the given requirement. If a chain of requirements is not met ("No"), then no establishment is likely (dead-end indicated by a cross).

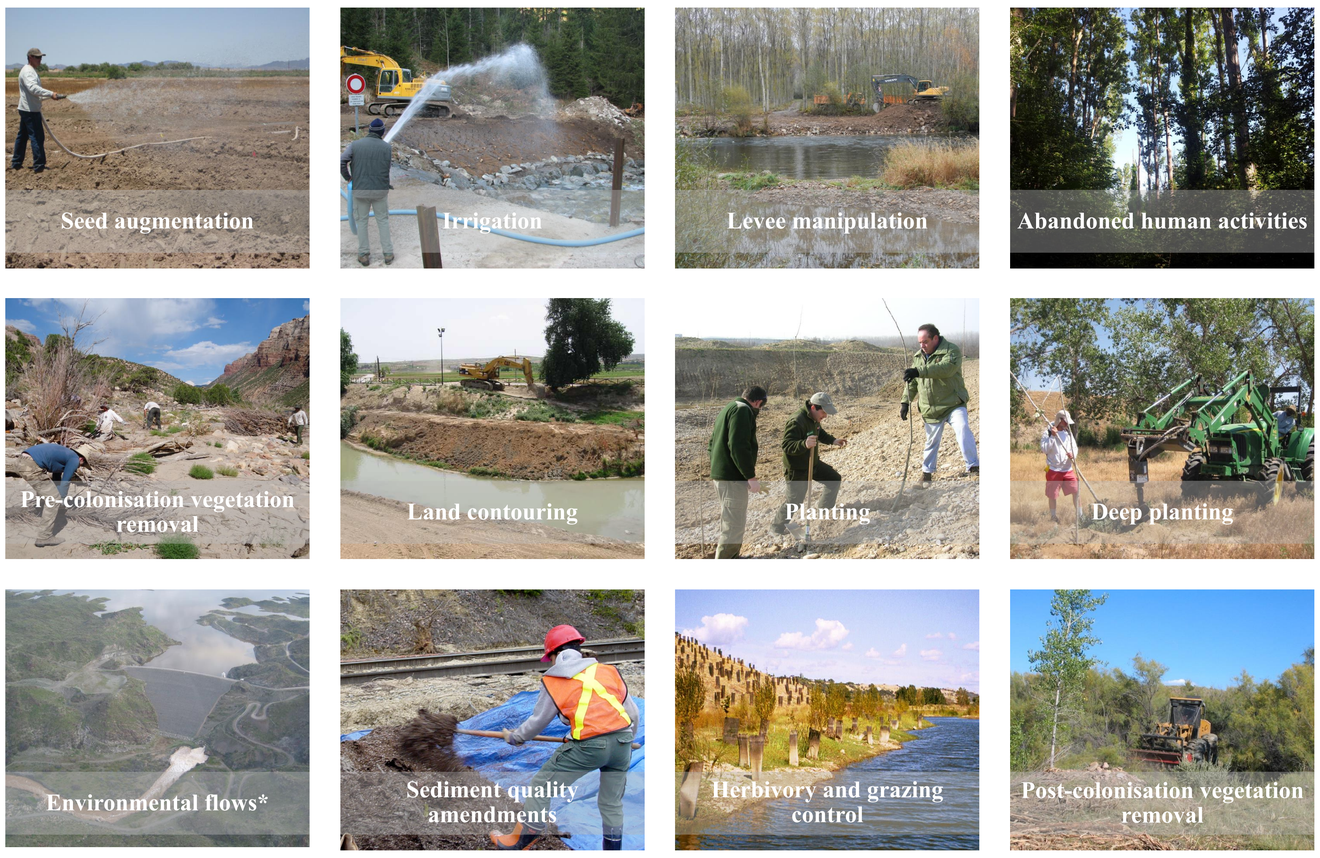

Figure 3. Images of actions to restore the regeneration of *Salicaceae* forests.

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