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Research Article

Controls on the sexual and asexual regeneration of Salicaceae along a highly dynamic, braided river system

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Abstract. Salicaceae are key pioneer riparian tree species that have the ability to reproduce sexually and asexually. Recent research has suggested that Salicaceae act as 'ecosystem engineers', modifying hydrological and geomorphological processes, resulting in the stabilisation and growth of landforms. Understanding these interactions requires knowledge of the controls on Salicaceae regeneration. This paper describes a study of Salicaceae establishment and growth along a reach of a highly dynamic, island-braided river. The sexual and asexual regeneration of three species were investigated using experimental planting of cuttings and observation of seedlings. Plots were located at a range of elevations, in different habitats associated with the established riparian vegetation and in contrasting sediment types. Survival and growth were monitored over two growing seasons. Asexual regeneration was more successful than sexual regeneration, with cuttings demonstrating faster growth rates and tolerance of broader environmental conditions than seedlings. Cutting survival and growth was highest in sediments with a relatively high organic content and in plots located between patchy Salicaceae stands or in the lee of islands. Seedling mortality was extremely high due to fluvial disturbance, although seedlings in habitats that were protected from fluvial disturbance survived. Seedling growth showed preferences for particular sedimentary conditions, which varied between species. The major control on regeneration was the upstream presence of established Salicaceae, particularly on islands, which provided open sites that were protected from fluvial disturbance and suitable for regeneration. Thus, asexual regeneration facilitated sexual regeneration by rapidly colonising sites that provided habitats protected from fluvial disturbance for seedling establishment. This supports previous work suggesting that Salicaceae can act as 'ecosystem engineers'.

Key words. Salicaceae; regeneration; riparian; disturbance; river islands; "ecosystem engineer".

Introduction

Within the northern temperate region, the Salicaceae are key riparian pioneer tree species that dominate the active zone of river floodplains through their interaction with hydrological and geomorphological processes (Hupp and Osterkamp, 1996; Gurnell, 1997; Nakamura et al., 2007). The Salicaceae have adaptations that facilitate their survival in highly disturbed environments, such as rapid growth rates and the ability to regenerate both sexually and asexually (e.g. Hughes et al., 2000; Karrenberg et al., 2002; Rood et al., 2003). Sexual regeneration occurs through the release of prolific quantities of minute, light seeds, which are readily dispersed by both wind and water. Their release during spring also coincides with high river flows on many river systems (Hughes et al.,

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