A SPECIAL IPC[1] WORKING PARTY ON COMMUNICATION AND OUTREACH (WP-COM) HIGHLIGHT SERIES:

'GLOBAL APPLICATIONS OF FAST-GROWING TREES IN AGROFORESTRY SYSTEMS'

How Poplars and Willows Can Contribute to Improved Water Quality

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Overview

New Zealand pastoral agriculture is very dependent on regular inputs of inorganic fertilizers and commonly implements practices that increase soil erosion (e.g., tillage, removal of groundcover). Farmlands, therefore, are important drivers of nonpoint source water pollution, contributing substantial amounts of sediment, phosphorus (P), and nitrogen (N) to New Zealand rivers and streams. Exacerbating this problem is streambank erosion which typically accounts for 50 to 90 percent of a stream's sediment and P load. Pastoral farmers are increasingly under legislative pressure to improve the quality of water moving from their farms into streams and rivers.

Figure 1. Poplars stabilizing a watercourse.

Poplars (*Populus* L.) and willows (*Salix* L.) are the bioengineering tools used by farmers in New Zealand to reduce sediment transfer and improve water quality. Both genera take up inorganic forms of P (from applied fertilizer or as mineralized P in the soil) and return P in organic forms at leaf fall and through root death. These trees do not store P but recycle it, since most P is used in the leaves. By reducing the rate of runoff and increasing infiltration, these trees reduce overland flow and loss of P into waterways (Fig. 1).

[1]The International Commission on Poplars and Other Fast-Growing Trees Sustaining People and the Environment (IPC)

All photos by the authors.

Outcomes

Poplars and willows provide other benefits to water quality, both through indirect and direct means. Indirectly, these plants provide shade and shelter to stock animals, which helps distribute animal excrement more widely as the animals disperse for shade and shelter, thereby leading to less-concentrated waste inputs into surface and groundwater. Poplars and willows improve water quality directly by terracing the land, which slows the runoff of sediment, P and N, and by shading and cooling stream water, which improves habitats for aquatic animals and recreational fishermen (Fig. 2a). Willows, particularly those established in riparian buffers, can also build up stream banks, leading to reduced, and even negative erosion rates over time (Fig. 2b). Overall, improvements in water quality are observed where pastoral slopes are planted with poplars and willows. These measures are improving the image of farmers as responsible environmentalists among the urban public in New Zealand and internationally.

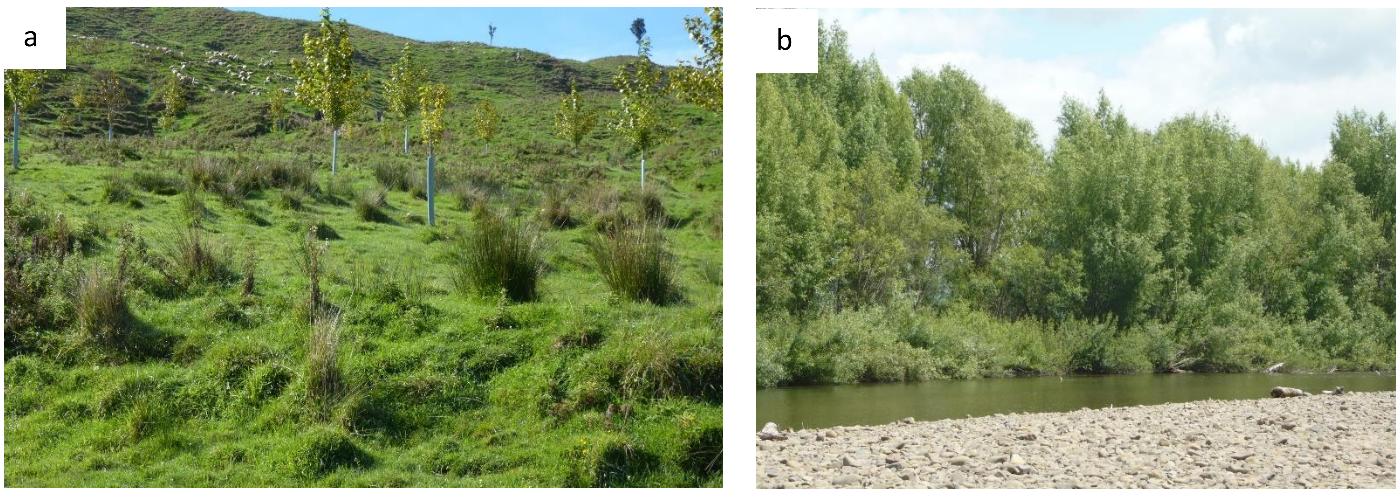

Figure 2. a) Hybrid poplars planted to stabilize a slope and intercept sediment before it reaches a stream, and b) willows protecting the banks of a stream.

Keywords: Erosion, agricultural pollution, streambank stabilization, water quality

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