

Willows in small Victorian streams: mechanisms of spread and geomorphic effects of *Salix fragilis*

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Research scope

1. How do willows alter the geomorphology of small to medium sized streams?
2. How do willows spread through small streams, and what is the optimum approach to managing the weed in small streams?
3. How do small streams change when willows are removed?

Results to date

1. Willows tend to widen small streams by invading the stream bed (Figure 1). As flow depth increases downstream, the willows can no longer invade the bed, and instead establish on the banks. Willows established on the bank tend to trap sediment and narrow the channel.
2. Between 1945 and 1991, willows invaded a small stream in central Victoria. The willows spread downstream from five distinct sites, at between 90 and 150m per year by both neighbourhood and long-distance diffusion. The first generation of propagules form dense stands that both trap propagules from upstream, as well as acting as sources for filling the zones between the clumps. Whilst managers tend to remove the dense willows first, it is more effective (and cost effective) to remove the 'pioneer' willows between the dense clumps. The dense clumps of willows actually act as 'chokes' on the diffusion of willows downstream.
3. When dense willows are removed from small streams, shade is reduced, the fine root wads rot down, releasing sediment and nutrients to the stream, and a new phase of bed erosion can be triggered. These effects are likely to last at least five years.

Implications for management

1. Willows have a major influence on the morphology of streams. All of these effects tend to reduce channel depth, increase roughness, and usually increase flood frequency.
2. The morphological effects of willows vary with stream size, as will the response of the stream to removing willows.
3. Removing dense stands of willows will have substantial morphological and water quality impacts on streams.
4. It is much more efficient to manage zones between dense willow clumps than to attack the dense clumps themselves. The dense clumps can actually serve as controls on the downstream spread of willows in small streams.

Further work needed / gaps

Evaluation of changes in the morphology and water quality of streams after willow removal.

Related publications

Several papers in the upcoming Stream Management Conference proceedings.

Acknowledgements

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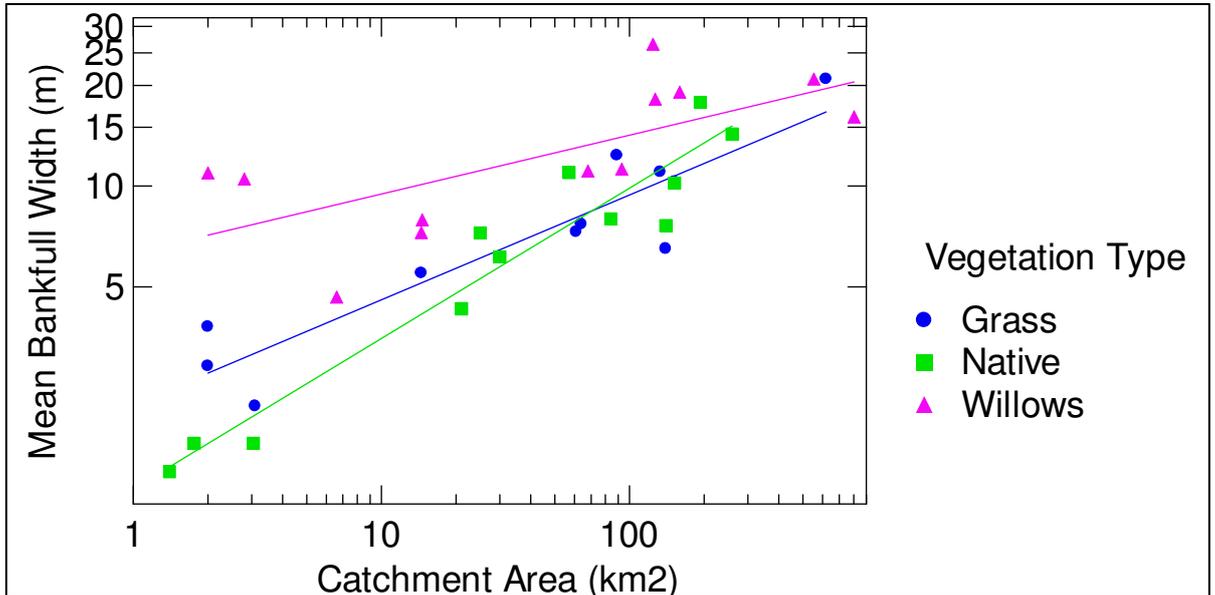


Figure 1: Mean bankfull width of streams with different riparian vegetation, plotted against catchment area

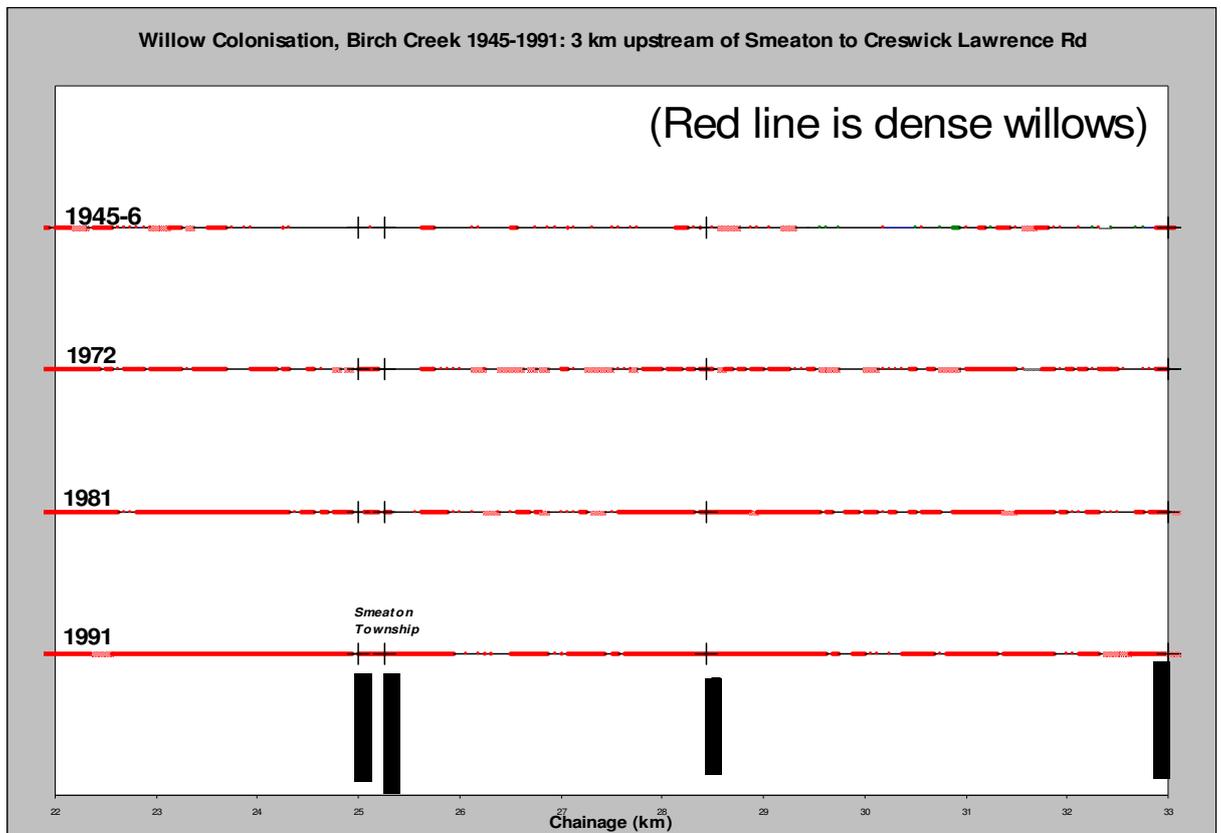


Figure 2: Willow colonisation between 1945 and 1991 on Birch Creek, central Victoria.