



Managing River Oaks and other in-stream vegetation in Gravel-bed Rivers on the NSW Coast

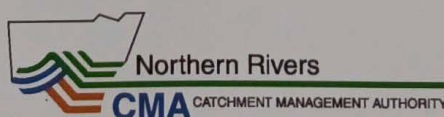
This fact sheet provides land managers with an understanding of the role of in-stream vegetation in the dynamics of the river channel, as well as tips and techniques for managing vegetation that grows in rivers with gravel beds.

The focus is on river oaks (*Casuarina cunninghamiana*) but much of it is also applicable to other vegetation that grows in river channels (e.g. Bottle Brush - *Callistemon viminalis*).

River oaks have always been part of the riverine landscape of the mid-north coast of New South Wales. Early settlers' notes suggest that vegetation grew in the river as well as on the floodplain when these valleys were first surveyed. These river oaks would have grown as emergent species within the floodplain forest and as colonisers on gravel bars. Today, river oaks are more common and numerous, and this increase is largely due to an increase in suitable habitat. This has led to the need for their management in some situations.



River oaks at Gordonville Crossing on the Bellinger River



Acknowledgments:

This leaflet is an initiative of Bellinger Landcare Inc and Tim Cohen, Fluvial Geomorphologist. It was produced in cooperation with Tony Broderick, Northern Rivers Catchment Management Authority. Artwork and layout by ArtbyDesign.

Channel widening has provided more habitat for oaks

When settlers first arrived in the valleys of the mid-north coast of NSW, river channels were much narrower, deeper and more winding in their length. After the floodplain and riparian vegetation was removed for agricultural development, flood-waters were conveyed more quickly down the valleys which lead to widespread bank erosion. As a result, the river channels have become 2 - 3 times wider, 4 - 5 times larger in capacity and about 5 -10% straighter. Straightening also has made the channels steeper, which increases the potential for erosion.

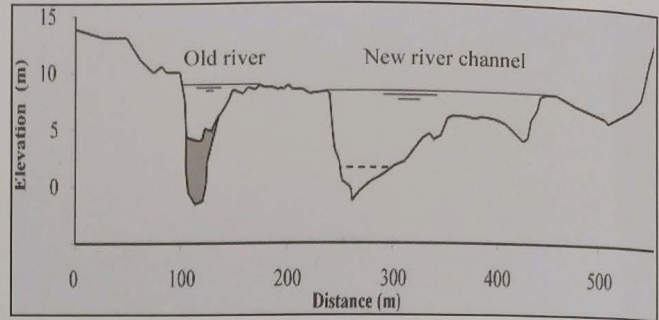
Why are there so many oaks now?

The floodplains associated with these once narrow river channels used to be regularly inundated by floods. However, as the rivers have widened, silt from the eroding banks continues to wash down stream and filling pools, and the gravel forms into gravel bars and islands.

The wider more shallow channel has more places for river oaks to colonise. River oaks are shallow-rooted fast growing trees and they have evolved to rapidly colonise disturbed areas (e.g. gravel bars and islands). Their small seed can settle and germinate after being transported by floodwaters. Records show that we are experiencing a downward trend in rainfall since 1977 which means fewer floods. This favours river oak establishment within the river channel.

Recovery after disturbance

River oaks take advantage of exposed gravel and sand and play a role in re-establishing a narrow channel. They help in the recovery process by stabilising gravel bars and protecting the toes of the banks from erosion. In-stream vegetation is often a positive sign of a river system in recovery.



Above: **Bellingher River channel size at Bellingher Island**
The old river channel was narrow and deep, the new channel is shallower and broader.

Using oaks to manage the recovery

In the management of in-stream vegetation, it is important to look at the river as a whole, not just at a property scale. This holistic view will provide for good over-all river management where oaks can be part of the solution to specific problems.

For example, gravel pulses move through the system and can infill pools or form bars. Some places are suitable and important to “lock up” gravel, with the help of oaks, to prevent pools from disappearing.

Other places where oaks have settled, may not be the best locations and oaks may cause problems there.

River oaks and other in-stream vegetation is protected by law and it is a specialist skill to decide how to manage them. Please refer to the back page for technical advice and permits.



Historical channel changes on the lower Bellingher River at Gordonville cutting



Note the presence of the bare gravel bars and shortcutting at the top left hand side of the photos, as a result of the 1950 flood, followed by progressive colonisation of river oaks (see picture on right).

Understanding the role of oaks in channel recovery

Vegetation on gravel bars and islands plays an important role in the recovery of an eroded and enlarged river channel. It does this by stabilising deposited gravel and silt and forms vegetated bars and islands.

The “locking up” of these sediments in bars and islands:

- reduces the amount of sediment available to wash downstream and fill pools, and
- narrows the channel and promotes the redevelopment of pools.

This sequence of photos shows how the river oaks have helped to stabilise an in-stream island and narrowed the river channel.



1996: Over-wide channel with island beginning to form (*on right*)



1999: Island is larger and bank erosion more severe (*centre of photo*)
Deposition of gravel continues, the island grows, a riffle develops up stream of the island.



2005: Livestock has been excluded and river oaks established on the island.

Deposited gravel has closed the gap to the eroding bank. The up-stream riffle has fully formed and a pool developed downstream.



Photos taken at Blaxlands Creek, Nymboida catchment

Common river oak management issues

Below are some typical and common river oak management issues and recommended actions. Increasing the strength of river banks with tree planting is always part of the solution and river oaks offer many benefits in this regard. Specific advice is available and a permit may be required for some of this work.



Issue 1: Scouring holes behind large individual river oaks.

Water flow forms eddies behind the stems of large trees and scours holes into the gravel bed.

Action:

Planting a greater density of trees and understorey plants (e.g. lomandra) around the trees will dissipate the flow and reduce scouring.

Issue 2: River oaks on gravel island narrow the channel and divert flow towards weak and unprotected bank.

Actions:

Increase overall bank strength through structural rehabilitation works and revegetation.

Cut or thin River Oaks to allow high flow over the gravel bed.

(Please note: permission is required).



Issue 3: Mature river oak fallen into the river bed and threatening to deflect flows into river bank.

Actions:

Pull trunk and rootball in against the bank with the rootball facing upstream and oriented away from the bank towards the channel. Depending on the size of the tree it may need to be anchored in place.

(Please note: permission is required to carry out works in streambeds).

Increase overall bank strength by planting a wider vegetated zone on top of the bank.



For further and site specific advice on the management of river oaks, please contact your local Catchment Management Authority or your local Landcare office.

For permits contact your local Council or the Department of Natural Resources.