



Water notes



ADVISORY NOTES FOR LAND MANAGERS ON RIVER AND WETLAND RESTORATION



The management and replacement of large woody debris in waterways

What is Large Woody Debris?

Large Woody Debris, or Snags, are tree branches, large limbs or whole trees which fall into a creek or river and are found either exposed, submerged or semi-submerged along the watercourse. Large Woody Debris (LWD) may remain in place where it falls or it may be washed downstream and come to rest against an embankment, rocks or other LWD.

Should LWD be removed from rivers?

Large Woody Debris plays an important role in the geomorphology and ecology of streams and rivers and should not be removed unless it represents a significant risk to flooding or channel stability. It may be preferable to modify or relocate, rather than remove LWD.

Large Woody Debris is often thought to contribute to flooding. There is, however, little evidence that LWD increases flood frequency or reduces the capacity of a river to carry flood waters. Water movement may be slowed by LWD, but substantial amounts are required before there is a significant effect on flooding.

Unless LWD is blocking more than 10% of the cross-sectional area of a river it will not impact on water levels and therefore should not be removed.

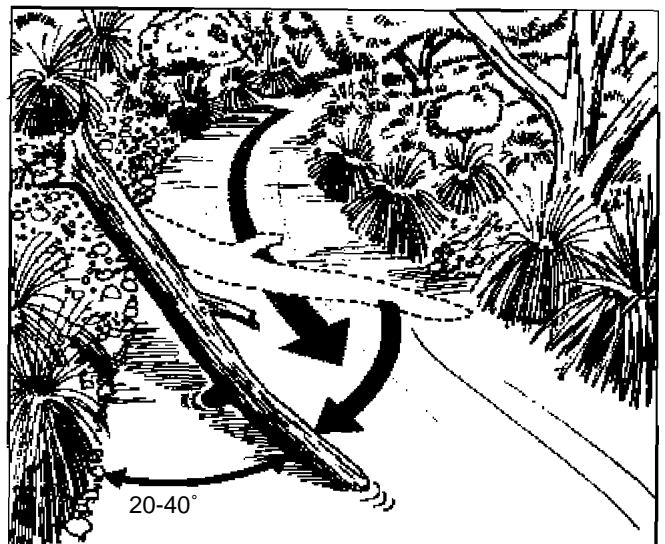
Large Woody Debris is also thought to cause channel shifts and increase erosion of river banks. This is true of large accumulations of LWD angled across the flow path and LWD oriented upstream.

Moderate amounts of LWD oriented in a downstream direction and positioned close to the bank will act to reduce bank erosion and have little effect on channel shape. The removal of LWD may increase bank erosion.

How can I modify LWD to improve flow?

Modifications to LWD instream may be more economically and ecologically favourable than large scale removal.

- The angle at which LWD is oriented instream will influence flow. Rotating LWD so that it points downstream at an angle of 20 - 40° to the bank will improve flow.
- Sparsely placed LWD (> 4 m apart) will have a greater influence on water levels than closely aligned pieces. Pieces of LWD that are aligned closely (2 - 4 m apart) will alter flow no more than a single item.
- The effect that a large piece of wood has on water levels is reduced where smaller pieces occur upstream and in close proximity (2 - 4 m apart) thereby streamlining flow.
- If branches that protrude above the water level are trapping large amounts of debris moving downstream, these should be cut off.



Repositioning LWD: The capacity of a river channel can be improved by rotating the LWD at an angle of 20° - 40° to the streambank. [Illustration by Dickinson Art].





Large Woody Debris plays an important role in the L. Pen geomorphology and ecology of rivers.

How can I modify or replace LWD to improve habitat?

In ecological terms the more wood present, the better the habitat values in a watercourse. However, it is important to ensure that the presence of LWD does not contribute to flooding or channel instability.

- Use the guidelines outlined above to ensure that LWD does not interfere with flow.
- Ensure that LWD does not block more than 10% of the cross-sectional area across the river.
- Use nearby undisturbed streams of similar size as a reference for the amount of LWD that should be present. In lowland rivers for which comparable undisturbed zones are not available, LWD loadings of $100\text{m}^3 \text{ha}^{-1}$ may be appropriate.
- LWD that is located in areas of low current velocity or on the inside of meanders will be more stable than that placed in erosive zones.
- Where possible, try to use wood from the same tree species as those that are natural to the area.
- Habitat value is improved by diversity in flow. Aim to have areas with turbulent water as well slower flowing areas.
- Use wood of different sizes and shape in order to enhance habitat diversity.
- Rough surfaces on wood provide better habitat for invertebrates than smooth surfaces.
- Do not use wood that has been treated with chemicals.

Management and planning considerations

- LWD may be redistributed under high flows, particularly where it occurs on mobile, sandy stream beds.
- LWD may require some maintenance to ensure that it is not creating channel blockage.

- Re-alignment or re-introduction of LWD requires the approval of the land-owner. All interested parties should be consulted.
- Individuals or groups planning to significantly alter instream loadings of wood or significant re-alignment LWD should consult a qualified stream hydrologist.
- Monitoring the success or otherwise of changes to instream loadings or alignment of LWD provides useful information for ongoing stream management.

Further reading

Available from Water and Rivers Commission

Water note WN8 *Habitat of rivers and creeks.*

Water note WN9 *The value of Large Woody Debris (Snags).*

Water note WN10 *Protecting riparian vegetation.*

Water note WN12 *The values of the riparian zone.*

Available from other sources

Gippel, C.J. (1992) *Literature review of the physical significance of Large Woody Debris (snags) in streams and rivers.* In: *The Hydraulic Basis of Snag Management.* University of Melbourne, Victoria. pp 1-19.

Gippel, C. Finlayson, B. & O'Niell (1998) *Managing Snags in Rivers.* Land & Water Resources Research & Development Corporation, Canberra.

Gippel, C.J. O'Neill, Finlayson, B.L. & Schnatz, I. (1996) *Hydraulic guidelines for the introduction and management of Large Woody Debris in lowland rivers.* *Regulated Rivers: Research & Management* 12: 223 — 236.

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For further information on any particular issue please contact the Restoration & Management Section at the Water and Rivers Commission.