

Water notes

Water notes for rivers management



ADVISORY NOTES FOR LAND MANAGERS ON RIVER AND WETLAND RESTORATION



Importance of Large Woody Debris in sandy bed streams

The rivers of the Swan Coastal Plain, on which the City of Perth is located, are very different from those that existed about 200 years ago. In their original state they were sandy bedded, heavily vegetated and loaded with woody debris. Today, much of the native riparian vegetation that once grew along them has been cleared, along with most of the rest of the native vegetation of the coastal plain. Furthermore, the majority of rivers were extensively de-snagged early in the last century to the extent that little large woody debris (LWD) remains in the channels. Consequently there has been a large increase in the amount of unstable sandy bed habitat, such that during the high flows of winter the river channels are almost devoid of fauna. Additionally, the lack of LWD has reduced the frequency and depth of pools, which are typically a refuge for aquatic fauna over the long hot summer.

Both major branches of the Dandalup River have been dammed for Perth's Drinking Water Supply. As part of the environmental studies for the North Dandalup Dam, completed in 1995, Dr Peter Davies from the University of Western Australia noted the lack of instream habitat in the

lower reaches of the river. In fact he has described the area as "an ecological desert". This prompted the idea for the Water and Rivers Commission to seek Federal funding from the Land and Water Resources Research and Development Corporation (LWRRDC) to investigate "the importance of large woody debris in sandy bed river systems". Funding was granted and the project began in the 97/98 Summer.

Project description

The objectives of the project are:

1. to develop techniques for the replacement and placement of large woody debris in sandy river channels; and
2. to monitor the ecological response to the replacement of large woody debris in sandy river channels.

Two reaches of the river were selected for the project.

A "Demonstration Site" in a highly degraded section of the Dandalup River 2 km upstream of its confluence with the Murray River. This site, which covers a distance of 500 metres and is located immediately upstream of the Paterson Road Bridge, is unfenced and subject to livestock grazing and trampling.

A "Reference Site" is located a further 6 km upstream on the South Dandalup River within Fairbridge Farm. This site has good regeneration of riparian vegetation and the river has been fenced off in recent years. Fairbridge Farm, once an orphanage, is now owned by Alcoa World Alumina Australia and the former "Farm School" buildings are leased back to Fairbridge Western Australia Incorporated. The village and farm are being developed to demonstrate best management practices for coastal plain farming and, just as importantly, as a focus for youth activity, while helping young people and other visitors to learn about the environment and sustainable farming.



Both sites had been sampled to measure habitat diversity using fish and macroinvertebrates, as part of previous environmental studies.

The Paterson Road site was established in May 1998, with the placement of 40 large tree trunks (some still including the butt) using a hydraulic excavator. At three locations (as shown on the plan) two logs were placed perpendicular to the flow to form "riffles". One very large trunk was placed mid-channel about 470m upstream of the bridge. All other logs were placed as "toe protection" either immediately upstream or downstream of the "riffles" or on the outside of meander bends.

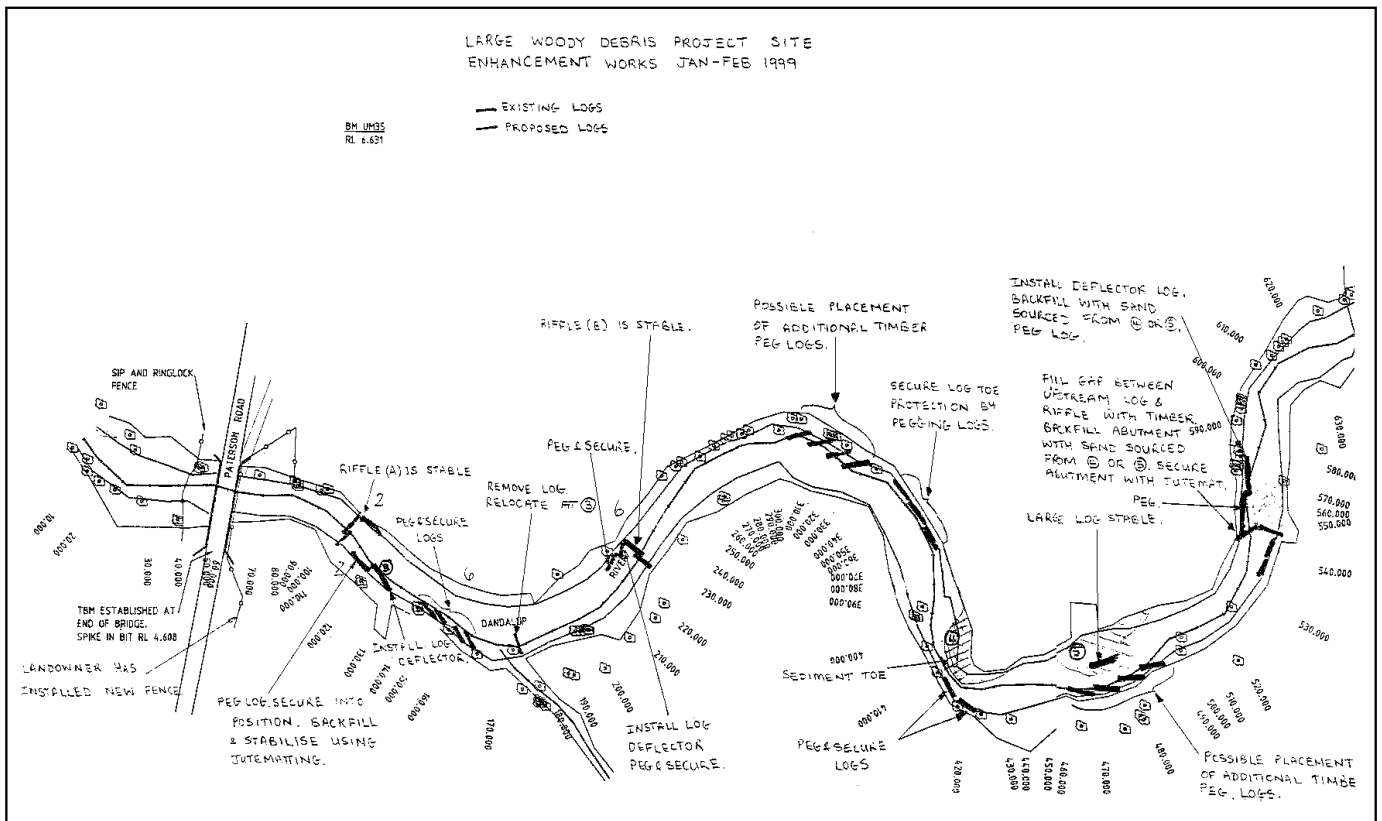
During the 1998 winter, which produced one major bankfull flow, several logs were moved downstream, with two lodged under the Paterson Road Bridge. These logs were moved from the outside of meander bends. The logs in the three perpendicular "riffles" remained in position. Scour holes had developed under and immediately downstream of these "riffles".

In February 1999 the logs which had moved were repositioned, an additional 12 logs were placed in the reach

and 4.5m long pine logs were jetted into the bed to secure the logs placed on the outside of bends.

No significant movement of logs were observed during the 1999 winter, however peak flows were much lower than in 1998.

The Fairbridge site was established in March 1999 over a 300 metre reach immediately downstream of a demonstration cattle crossing. As the riparian vegetation is well established in this reach it was not possible to use mechanical equipment to position the logs. Therefore the site was established through the Fairbridge "Ecohouse Project". Ten Landcare trainees manually dragged the logs into position and secured them. Thirty logs of somewhat smaller size than at Paterson Road were positioned. The logs were retained using pine logs and galvanised "fencing droppers" jetted or driven into the bed. Sedges and rushes were also transplanted and brushing installed to protect banks from undercutting. Some minor movement of logs, those partially secured by pine logs, occurred during the 1999 winter. This was easily rectified.



Paterson Road Site Plan.



Monitoring

A photographic record is the primary method of monitoring the stability of the woody debris that has been placed in the channel.

Dr Peter Davies from the Zoology Department at the University of WA is undertaking the ecological monitoring for this project. Three sampling surveys have been undertaken: in November 1997 (prior to LWD installation), February 1999 (after LWD installation) and November 1999.

An increase in fish diversity is the initial consequence of the LWD installation which has been measured to date. The number of fish species recorded increased substantially, from one in 1997 to six in 1999.

The macroinvertebrate response has been more difficult to interpret. At the Paterson Road site, while there was a significant response to the LWD measured in February 1999 (species identified increased from 42 to 52), this was not sustained in the November 1999 sampling. This reduction in biodiversity has been attributed to seasonal differences caused by higher river flows in November (spring) compared to February (summer). The loads of LWD appear insufficient to create enough diversity of hydraulic habitats during high flow periods. However, these initial results may be indicative of the benefits of increased LWD during the long periods of low flow experienced during the summer in the south west of Western Australia.

Further monitoring will be undertaken to more accurately determine the response of these sites to the presence of the LWD.



Log riffle B.

A. Davy



Logs pinned against bank.

B. Till



Log riffle C.

B. Till





Installing logs at Fairbridge site.

G. Heady



Fairbridge site log riffle.

G. Heady

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