Forestry for Life

EASTLAND WOOD COUNCIL

Successfully planted forests for erosion control

Historically, lower river reaches meandered over unconstrained flood plains lined with large native forests. These areas are now intensively farmed, cropped or inhabited with housing and/or infrastructure and rivers straightened and intensively stop banked to minimise the natural processes of flooding.

Planting of pinus radiata forests has been promoted by government on the highly erodible steep hill country of the Gisborne district to minimise the unacceptable level of erosion caused since clearing of native forest for farming began. There are good examples of where forestry has been successfully commenced, reversing this erosion, reducing sediment loads and increasing water quality.

However, large storm events immediately after harvest and coupled with some land types/conditions have resulted in landslides carrying high volumes of woody debris into the waterways and downstream.

Common opinion is that leaving wider riparian margins along waterways will reduce the amount of slash migrating downstream.

Most slash evident to the public on neighbouring properties after recent storm events are a result of mid-slope failures, not slash left in the waterway after harvest.

Our leading environment experts tell us:

Debris flows have always happened in steep young geologies subject to high intensity storms. They are the natural channel-forming process.

Debris flows occur in all forested types. The frequency may reduce under tall native forests or regenerating scrub forest.

Debris flows initiate from very small failure points that are generally not predictable.

Once under way, debris flows on steep slopes can bulldoze though substantial amounts of vegetation.

Wide riparian margins are often still dominated by grass cover and limited regeneration of native pioneering plant species, even after 30 years of growing the forest.

In the event of a large debris flow, the spindly native just adds fuel to the abrasive slurry.

So it is unlikely wider riparian zones will play a key role in preventing slash migration from mid-slop failures.

What are the benefits of planted forests for erosion control?

For stands more than eight years old:

- a 90 percent reduction in shallow landsliding
- reduced rates of earth flow movement
- a 50 percent reduction in gully-derived sediment
- retention of soil on hills where it can continue to be used for productive purposes
- in time the reduction in sediment supply to stream channels means improved water quality
- improved in-stream habitat equivalent to those of streams draining indigenous forest
- off-site benefits include a reduction in sediment to larger rivers and coastal ecosystems
- an improvement in flood hazard management
- the reduction in sediment accumulation rates in major catchments declines.

Preventing slash migration …

So how do we quickly and economically replicate the natural process of preventing slash migration from existing production forests in conditions ripe for failure?

Hikurangi Forest Farms have trialled delaying harvest of strategic areas of production forest where mature pine trees are closely planted to the waterway, are on the lower reaches of forest boundary and accessible to machinery.

These areas are typically a planned clearfell harvest area — generally between five and 10 hectares in size.

The area upstream of the natural slash catcher stand is harvested whilst the remaining trees are left growing for up to another five years.

When the next upstream tree crop is providing canopy cover and soil is past the window of vulnerability, the natural slash catcher area can be harvested. It is then re-planted so trees are mature enough and serve the same role in the next rotation.

Slash catchers work most effectively when located with wide open adjacent river flats allowing floodwater energy to be dissipated.

In large scale forest blocks, this philosophy can be replicated on multiple sites, providing numerous collection points and further minimising the extent of stream damage along its length.

While the natural slash catcher coupe could be planted in alternative species, mature pine trees are the preferred option.

Some natural slash catcher sites may by default be suitable to plant alternative species which are never harvested.

Species must be cleverly chosen or they run the risk at next harvest of being still too small and they could be destroyed, providing no downstream protection.

Unfortunately because many mature forests have a blanket set-back when planted, there are not mature trees available to utilise this methodology for current harvest.

The next phase for Hikurangi Forest Farms is to identify known sites through the forest suitable as natural slash catchers in the replanting plan, which follows harvest.

These sites should be planted up to the stream bank and trees tended to enhance their future effectiveness thus providing another tool and level of protection for the next harvest in 30 years' time.

This is no absolute solution but an effective and proven tool to mitigate the effects of woody debris migration.

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Land use issues his focus

Dr Mike Marden looks back on a career he hopes has made a difference, and with plenty of highlights.

Over the past 30 years he has been involved in documenting and publishing papers on many of the land use issues — in particular relating to erosion and erosion mitigation — facing the East Coast region,

Much of Dr Marden's research is forestry sector focused, including documentation of the stabilising influence of planted exotic forest on erosion-prone landscapes, and the benefits of reducing the amount of sediment getting into each of the three main East Coast rivers.

More recently his focus has been to document the on-site impacts of storms on these erosion-prone landscapes when forests are clear-felled, and to assess the significance of sediment generated from forest cutover during the years when these sites are most vulnerable to the initiation of erosion.

There is now increasing interest in the potential of indigenous tree and shrub species to replace the traditional poplar and willow as riparian plantings to stabilise eroding riverbanks, the use of manuka reversion and/or planted manuka as a means of stabilising eroding hillsides, together with the carbon sequestration potential of many of these species.

That focus has switched Dr Marden's research to measuring growth rates over time which aims to better understand the role root systems play in reinforcing the soil; and to assess the time (years after planting) when they are likely to provide an effective tree cover that will significantly reduce the likelihood or severity of landslide initiation during future storm events.

A major part of a scientist's role these days is to research and provide information of relevance to end users. In Dr Marden's case that includes district and regional councils, the Department of Conservation, forest companies, Ministry for the Environment, Ministry for Primary Industries, private consultants, and other Crown Research Institutes.

As well, he does presentations at conferences and to local interested groups, hosts interns from overseas universities during their studies, and acts as tour guide for politicians and students from international and local universities.

During his career Dr Marden has published more than 60 scientific papers, eight book chapters, 50-plus contract reports, numerous newspaper items and articles for popular magazines, the occasional radio interview, and a TV appearance.

While retirement and closure of the Landcare Research Gisborne office is nigh, Dr Marden hopes to be able to offer his expertise for some years to come.

He graduated with a BSc and MSc in geology from Canterbury University before undertaking a doctorate at Massey University where he gained an understanding of the influence geology, vegetation and climate have on the type and extent of erosion following storm events in the southern Ruahine Range.

His research put him in good stead following his appointment to the Forest Research Institute office in Gisborne, which later became part of Landcare Research.